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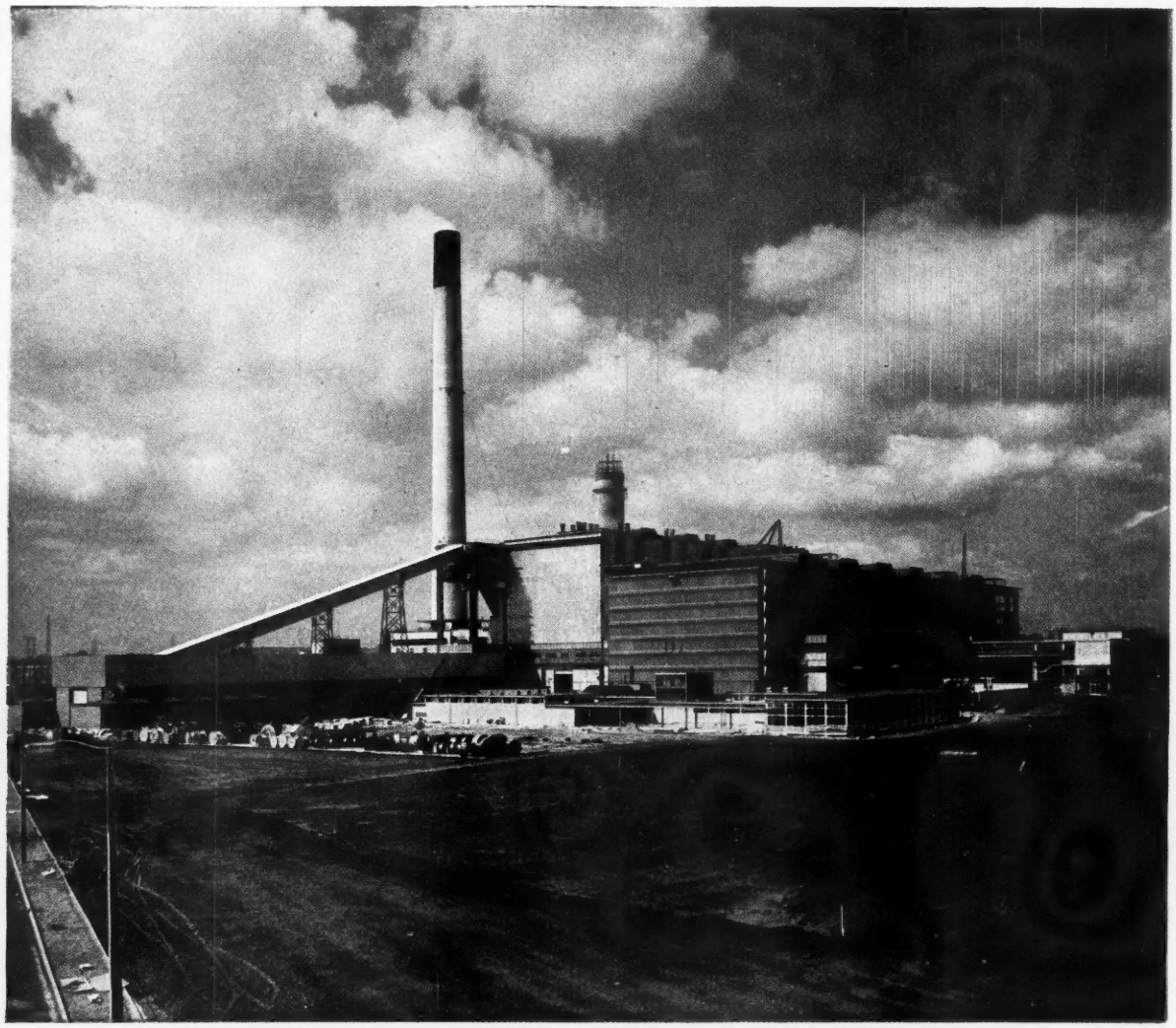

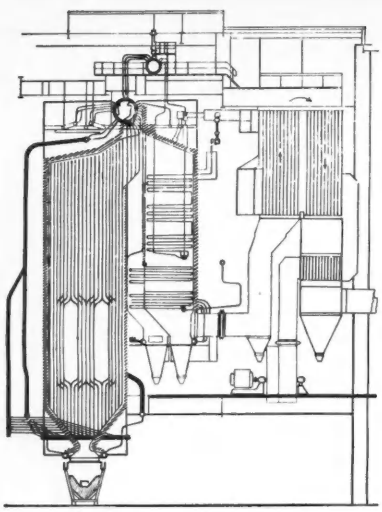

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5 APRIL
1957

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

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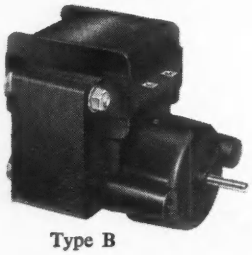

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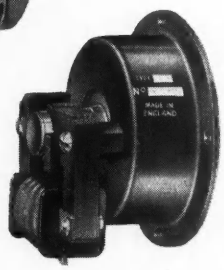

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SOME OF ITS APPLICATIONS

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Flow Control
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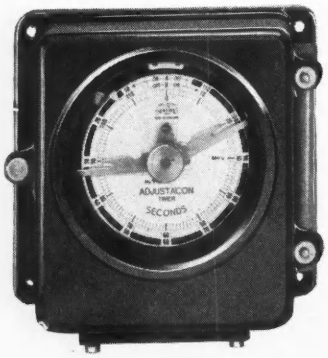
Stoker Controls
Thermostatic Controls
Time Clocks
Traffic Signals
Welding Cycle Recorders



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ELECTRICAL REVIEW

5 April 1957 Vol. 160 No. 14 Established 1872

Power Plant Design

VIGOROUS programmes of research and development work have been pursued for many years now in an effort to improve the overall efficiency of operation of coal and oil fired thermal power stations and great progress has been made during the past twenty-five years. Boiler design has reached a stage of such reliability that it has been possible to introduce the unit principle of operation by which a boiler, turbine and alternator are operated as a single unit from one control panel which is usually situated between the boiler and turbine at operating floor level. Steam interconnections are rarely provided in stations of this design, except for emergency operation.

Steam pressures and temperatures have increased greatly: figures of 1,500 lb/sq in and 1,050 deg F are becoming commonplace and designers are now considering seriously steam conditions up to and above the critical point. Turbo-alternator sets and boilers have also increased in size to achieve higher efficiency and, at the same time, reduce the capital cost per kW of installed capacity. By way of illustration, a generating station accommodating 100 MW sets would at present cost about £60/kW, but if 500 MW sets were used the plant would cost less than £40/kW.

Development work has accelerated, particularly during the last year or so, and now there are re-heat turbines of improved performance, machines with only three bearings to reduce their overall length, and alternators with direct water cooling of their stator windings. It is only by developments of this kind that it has become possible to make very large generating units, but to judge by the designs projected by British engineers at the present time it would seem that things are progressing favourably and to the more or less complete satisfaction of those concerned.

This may be so, but the bulk of the plant and machinery concerned is made largely from metal of one sort or another and consequently a great deal depends upon the metallurgist who is required to produce materials which will not limit unduly the efforts of the plant designer. Although the latest designs of generating plant installed in this country have proved to be satisfactory some difficulties have been experienced and it is evident that we need to know more about the behaviour of metals subjected to high pressures and temperatures.

There is, however, a serious shortage of metallurgists in this country and this could have grave consequences, particularly in view of our aspirations in the nuclear power field where metallurgical considerations are an even greater factor in the performance and design of the plant. Each year our universities and technical colleges are producing only about one-tenth of the number of metallurgists needed by industry. As is the case in many fields of technology the explanation of this state of affairs appears to be simply that suitable students are not coming up from the schools. But whatever is the explanation it is obvious that something must be done soon if our present serious difficulties are not to hold up progress.

OBJECTIONS TO THE BILL

A number of Conservative M.P.s were apprehensive of the possibilities latent in the provision in the Electricity Bill giving the proposed Generating Board power to manufacture electrical plant. This, of course, was really a continuation of a similar provision in the 1947 Act with the omission of "fittings." It was the view of the Members that this presented a future Labour Government with an easy way of nationalising the heavy electrical industry; the same fear was expressed when the 1947 measure was under discussion.

There may be some grounds for this view, but even now that the provision is to be limited to the production of parts for repair and maintenance or equipment for "research and development," the possibility remains, although it would probably take a little time for an amending Bill restoring the powers to go through Parliament.

The same group wishes to give the Electricity Boards financial independence of the Treasury guarantee, but as they would still be under Treasury surveillance the Boards (and consequently their customers) would only have to pay more in the way of interest for a merely nominal freedom.

HIGHER CHARGES

Most of the Electricity Boards had already drawn up new scales of charges or had announced their intention to do so before the Central Electricity Board published its new bulk supply tariff. Views on the effects of the tariff upon charges to consumers vary from Board to Board. Some appear to have anticipated the increase in their new retail tariffs but others say that the effects have yet to be assessed—and possibly passed on in the way of higher charges.

One Board accepts it as axiomatic that the consumer must pay, but this need not always be the case. There should be a constant scrutiny of operations to see whether it is possible to make economies to offset the higher bulk supply costs.

Since the publication of the bulk supply tariff matters have been further complicated by a general increase in wages in the electricity supply industry. This makes the efficiency check all the more necessary.

WELSH WATER RESOURCES

In a memorandum published last week by the Welsh Economic Development Council, the recommendation is made that consideration should be given to the means of financing the full development of the water resources of Wales and that adequate water supplies should be made available in Wales by the Welsh authorities. Claims are made that all sorts of water demand in England and Wales might be met by Welsh water supply and by using United Kingdom and American statistics there is the implication that Welsh water could be used for cooling purposes in connection with both conventional and nuclear power stations.

The question of direct hydro-electric generation, however, appears to receive very little, if any, attention. A fairly considerable amount of water power in North Wales has been devoted to electricity generation for many years, and this is being extended by the Central Electricity Authority. Further, we have little doubt that the reservoir capacity of this mountainous country will be shown by future surveys to be increased greatly beyond what is at present envisaged. And because of this potential aid to Welsh economy it seems only reasonable that the Development Council should make some contribution to the survey work.

I.E.S. CONSTITUTIONAL CHANGES

We reported in our 8th March issue that an extraordinary meeting of the Illuminating Engineering Society was to be held on 26th March to consider resolutions for making certain changes in the Society's constitution. These were approved at the meeting but a special resolution for the alteration of the Society's name to "Lighting Society" was rejected.

One of the principal innovations is that the Society will institute a diploma in lighting engineering. Diploma membership (Dip. I.E.S.) will take the place of the present Register of Lighting Engineers and those already on the Register will be eligible for the diploma.

SUPPLY AND DEMAND

A reversal of the old view in economics that "demand creates supply" has often occurred as the result of the availability of a source of cheap electricity. A notable instance of faith that supply will create demand is shown in a three-year investigation carried out in Canada and described by Mr. J. M. Wardle before the Institution of Civil Engineers.

The proposal is to harness the Yukon River by stages to provide ultimately 4,000 MW, although no appreciable local market at present exists for the power. The expectation confidently expressed is that heavy electricity consuming industries will be increasingly transferred to a source of cheap power, greatly amplifying a trend already noticeable in some countries.

EARTHING AT POWER STATIONS

How mere growth of electrical demand, not necessarily accompanied by technical advance, may render unsuitable methods formerly found satisfactory is exemplified in earth-electrode systems for large power stations. The old practice of regarding most soils as possessing a low enough resistivity to cope with earth-fault currents with the aid of fortuitous earths, such as those provided by the metal work of structures, no longer furnishes a reliable means of avoiding shock or damage to apparatus.

The evaluation of different systems of meeting varying conditions given by Mr. J. D. Humphries in his I.E.E. paper and the form of measurements he described indicate the lines along which, as he suggested, further research might be conducted.

In the next of our illustrated surveys of domestic electrical appliances (12th April) we shall be dealing with floor polishers. Particulars, given in tabular form, will include details of type, motor, weight, finish, price and purchase tax. The subject of the following survey (3rd May) will be dry shavers

Scientific Instrument Developments

By P. L. DEGEN

Survey of the Physical Society Exhibition

THE exhibition of scientific instruments and apparatus, which was held in London last week, was the forty-first in the series organised each year by the Physical Society. As was the case last year, the exhibition occupied both the old and new halls of the Royal Horticultural Society. The exhibition ran from 25th to 28th March, and the formal opening was carried out by Professor P. M. S. Blackett, M.A., F.R.S.

The discourses and demonstration lectures ranged from the very general to the particular: on Monday evening the Astronomer Royal, Sir Harold Spencer Jones, delivered a discourse on the International Geophysical Year, which he described as the largest scheme of international co-operation in science ever to have been undertaken, whilst on the following day Dr. E. Mendoza described how the development of a commercially manufactured helium liquefier and efficient metal dewars has within a few years led to a tenfold increase in the number of low-temperature laboratories throughout the world, and discussed some applications of low-temperature research. On Wednesday, 27th March, Professor E. G. Richardson surveyed three aspects of acoustics at least one of which, the reduction of aerodynamic noise from jet engines, is of wide practical and personal interest.

Nuclear Power Instrumentation

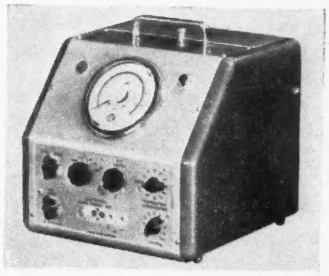
As in previous years, exhibits were to be seen on numerous stands connected either with the increasing use of nuclear power in industry, or consisting of instruments for further research and development or for civil defence monitoring. Most of the compact equipments designed for the latter purpose were highly transistorised and extremely compact, either audible or meter indication being employed. Instrumentation for the operation of reactors was displayed on several stands. In respect of one of these displays, it was claimed that this instrumentation is in use in almost every European reactor. On another stand there was displayed a model of a 5 MW "swimming pool" research reactor, moderated, cooled and partly shielded by ordinary light water, which is expected to be completed by the end of this year.

The control of health hazards by adequate monitoring is obviously of the highest importance in these peaceful applications of nuclear energy, and in establishments such as Harwell. The hand-held instruments mentioned above play their part; also larger instruments with large "air-wall" characteristic ionisation chambers, one of which covers the range from the permissible dose level up to 10,000 roentgens per hour, indication being on a single 10in scale with logarithmic presentation. The hazard of airborne radioactive dust can be controlled by the use of a sampling equipment consisting of loading and unloading jigs, alpha, beta and gamma probes, and ratemeter. Collection of the dust is on filter paper discs. A development of this, which is suitable for general use by industrial and public health authorities, is an automatic air pollution recorder in which samples are taken every 1, 8 or 12 hours on a time-marked filter paper strip. The equipment is designed to run for long periods unattended.

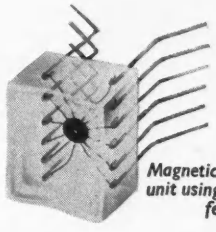
Digital Techniques

An interesting trend to be observed is the increasing use of digital techniques in a wide variety of applications. These include a digital voltmeter which measures d.c. voltages up to about 10 mV. It is constructed entirely of transistors, semi-conductor diodes and relays comprising an automatically balancing potentiometer, recording the voltage as a ten-digit binary number.

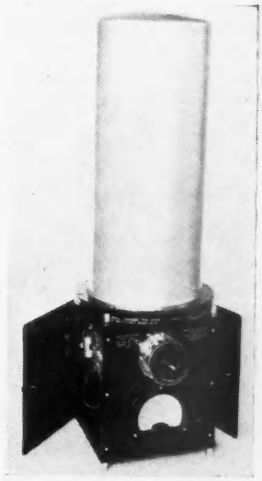
Less unusual applications include a digital microsecond chronometer covering the range 3 μsec to 1 sec based on a 1 Mc/s crystal controlled oscillator, and a digital frequency meter for the range 10 c/s to 30 Mc/s. In this instrument frequencies from 10 c/s to 1 Mc/s are measured on a six-digit counter utilising a 1 Mc/s crystal oscillator counted down to provide intervals of 0·01, 0·1, 1 and 10 sec. Frequencies above 1 Mc/s are passed to an unusual triple heterodyne system in which the output of a variable frequency oscillator is mixed both with the signal and with all harmonics from 1st to 32nd of a 1 Mc/s crystal: the two i.f.s are mixed to produce a signal in the range 2-3 Mc/s and then again mixed with a 3 Mc/s frequency to provide an output of between 0-1 Mc/s, which is counted as before. The frequency is then read as the sum of the integral number of megacycles on the dial of the variable frequency oscillator plus the six-digit counter reading. No switching is involved in this range



Master pH meter



Magnetic data store unit using square loop ferrite



Airwall ionisation chamber and amplifier

and drift in the variable frequency oscillator cancels out in the third mixing.

Another frequency monitor covers the range 10 c/s to 11·2 Mc/s by direct counting to produce an 8-digital indication; frequencies from 11·2 to 20 Mc/s are first heterodyned with a crystal-derived 11 Mc/s and fed into the normal counting channels: the action of selecting the higher range automatically sets the first counters at a count of 11.

A frequency standard providing pulse signals of 100 c/s, 1 kc/s, 10 kc/s, 100 kc/s, 1 Mc/s and 5 Mc/s, is based on a temperature controlled quartz crystal and multivibrator dividers: harmonics are useful for frequency comparison up to 200 Mc/s and the accuracy is 2 in 10^6. An altogether different order of magnitude of accuracy is provided by a portable instrument on another stand. This is the caesium clock, which consists of a sealed-off evacuated tube containing a caesium oven, hot wire ioniser, and an r.f. system fed from an external microwave oscillator, with external magnets. The output from the detector can be used as an error signal to actuate a servomechanism locking the frequency of an external oscillator, to an accuracy of less than 1 in 10^9.

A high stability v.l.f. oscillator provides quadrature outputs and covers the frequency range from 0·1 c/s to 10 kc/s, providing an output of up to 25 V constant throughout the entire frequency range. Another oscillator covers the range 10 c/s to 100 kc/s in four decades: in each range are ten fixed frequencies and a continuously variable control with approximately logarithmic scale which interpolates between them: outputs via a step attenuator covering from +10 dB to −70 dB referred to a level of 1 mW, and 1-30 V on five decade ranges are provided. A wide band a.m./f.m. signal generator provides unmodulated or a.m. signals from 5 to 220 Mc/s or f.m. signals from 65 to 120 Mc/s with a general accuracy of about 1 per cent but with the facility of local calibration by beating the output against standard frequency transmissions.

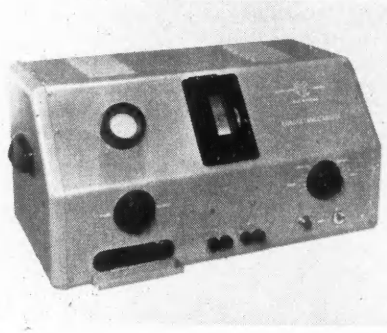
Pulse Generators

A delayed square pulse generator provides a wide range of amplitude, repetition rate, width and delay with direct-reading calibration: the rise-time is 0·01 μsec, and the output contains components of several hundreds of megacycles. The output consists of a pulse of either polarity and width variable from 0·2 μsec to 2 sec, preceded by a pulse, the time interval between them being continuously variable from 0·2 μsec to 2 sec; alternatively, a square wave of frequency from 0·25 c/s to 2·5 Mc/s is available. Forced-draught ventilation is employed to ensure stability and reliability. Another pulse generator was designed for service requirements: it has three alternative outputs, each of which can be attenuated to 10 μV when servicing radar and allied equipment. The frequency ranges of the sine and square wave oscillators are from 50 c/s to 50 kc/s, and pulses of 8 widths from 0·1 to 20 μsec are available, with rise and fall times of less than 0·05 μsec to 1 μsec.

The operations of addition and subtraction are carried out by a bi-directional register. Positive pulses at a maximum repetition rate of 100 per second can be applied to either of two channels, which rotate a dekatron glow in either a clockwise or an anti-clockwise direction. Addition or subtraction are thus indicated, and the maximum count is one million. Multiplication is carried out by means of an electro-mechanical device—a modified tacho-generator, in which the output is a linear function of both r.p.m. and displacement of a rotor. The unit was displayed coupled to a torque meter, the product of torque and rotational speed being indicated as horsepower.

Two balancing equipments, one for the balancing of individual rotating parts up to 50 lb, and another applicable to components *in situ*, each make use of electromagnetic pick-ups and a high-gain amplifier to detect vibration. In the first case the weight to be added or subtracted is indicated directly, and an image of the rotor with the position of unbalance is stroboscopically indicated; in the second a trial weight is attached, and the two sets of vibration readings determine the correction by means of a geometrical construction. A micrometer for the indication of the thickness of a moving web over the range 0·0001 to 0·04in utilises a magnetic detector head and a similar head driven by a servo until a balance is achieved in a bridge circuit. The thickness of non-magnetic and non-conducting material such as paper or plastic is then indicated on a counter driven from the servo.

One well-known manufacturer markets a very wide range of instruments for chemical and general laboratory and industrial use. They include a laboratory pH meter with an 11in scale and full temperature compensation, and an industrial pH amplifier in a robust, splash-proof flush-mounting case. Full automatic temperature compensation is provided, and the output is indicated on an 8in scale and can be used to drive remote indicators or recorders. A direct reading instrument measures electrolytic conductivity in the distilled/de-ionised water range of 0·1 to 100 micromhos. A conductance bridge with



Conductance bridge with c.r.t. balance indication

cathode-ray oscilloscope balance indication covers the range 0·1 micromho to 10 mhos in four stages: the accuracy is ±0·2 per cent. A battery-operated high-resistance test set reads from 2 million megohms to 3 megohms in five ranges; a low-resistance measuring apparatus utilises a voltmeter reading down to 1 μV thus enabling very low resistances to be measured without the need for excessively high currents. A thermocouple test set comprises all necessary apparatus for measuring and calibrating thermocouple e.m.f.s, measurement of thermocouple resistance and calibration of indicators and recorders. Another stand showed a precision potentiometer for the measurement of thermocouple e.m.f.s: the ranges covered are 0-0·11111 V and 0-0·011111 V calibrated against a standard cell within ±10 μV. The e.m.f. is read on five decade dials, and all measuring resistors are housed in a lagged metal chamber. Another range of instruments includes a megohmmeter reading up to 100 million megohms and a general purpose d.c. amplifier with accessory units providing current measurement down to 10^{-14} A, resistance up to 10^{15} ohms and pH determinations within the range pH 3-10 to 0·002 pH.

The "Strobograph" stroboscopic recording oscillograph

Yet another megohmmeter measures resistances up to 10^{14} ohms with a voltage continuously variable up to 1,000 V, whilst a novel technique for measuring resistances between 10^7 and 10^{14} ohms consists of charging a capacitor to 1, 10 or 100 V through a linearising feedback circuit and recording the time on an electrically operated stopwatch.

Two d.c. amplifiers were shown for the amplification of very small currents, in the one case down to 100 $\mu\mu$A and in the other from 1 μA to 1 $\mu\mu$A with a 100 mV output for recorder operation, designed for measuring the minute currents produced in ionisation chambers. Another d.c. amplifier has a frequency response from 0 to 1·5 Mc/s with a gain of 7,000 and is adapted to drive a cathode-ray tube deflection system in push-pull.

Among the many oscilloscopes exhibited the following may be noted: a constant bandwidth instrument with (−3 dB) bandwidth from 1 c/s to 9 Mc/s, time base repetition rate range from 17·5 c/s to 200 kc/s and calibration pips at 10 μsec, 1 μsec or 0·1 μsec intervals; a multi-channel (up to twelve channels) oscilloscope with the recording tubes housed in a separate cabinet with camera and optical system; and a wide-band measuring oscilloscope with a Y amplifier frequency range from d.c. to 19 Mc/s (−3 dB) and 25 Mc/s (−6 dB), variable e.h.t. from 1 kV to 10 kV and various sub-units available to increase its versatility. Oscilloscope cameras included a model with quick developing unit, one loading of film providing eight exposures of which each print is fully developed in 60 seconds; another camera is based on a 16in diameter drum providing paper speeds between 24 and 25,000in per second: two different lenses are available according to width of recording film or paper employed.

Developments in cathode-ray tubes included a travelling wave deflection system: for the recording of millimicrosecond events transit time effects in the deflector plates can normally be reduced only at the expense of sensitivity, but in this new tube the electron beam passes between an outer cylinder and an inner helical tape. The velocity of the electron beam is arranged to equal the axial velocity of the waveform along the helix, thus every passage of the electron beam past a turn of the helix leads to a further deflection force, and high sensitivity is attained. A second development is the introduction of a fine mesh grid: the mutual conductance is increased considerably and bright displays can be obtained with much reduced drive voltages.

Another new cathode-ray tube is designed as a stroboscope light source: phosphor decay times of 3 μsec and 1 μsec with reduced luminous efficiency allow very much higher repetition rates to be attained, up to several kilocycles per second; a conventional stroboscope displayed nearby covered the frequency range from 120 to 10,000 flashes per minute. The "Strobograph" is a recording oscillograph for the precise delineation of recurrent waveforms in about 30 sec. It incorporates a ball-point pen writing on standard graph paper.

Among components and materials exhibited were an extended range of tantalum electrolytic capacitors: these are now available from 0·25 to 750 μF with working voltages between 3 and 70 V, and are extremely small, the largest of six sizes measuring only 0·24in by 0·87in diameter.

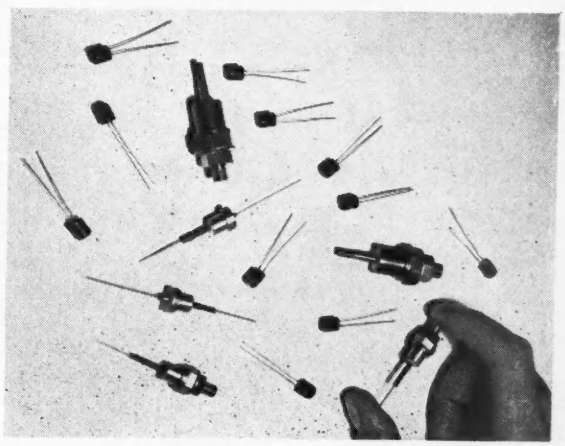
Ferrite Applications

Ferro-electric ceramics bonded to thin strips of metal operate under applied voltage in a manner similar to a thermosensitive bimetallic strip. This is utilised in electrostrictive relays, which are compact and have very low power consumption: after operating, only a negligible leakage current is dissipated in holding in the relay.

Square loop ferrites are utilised in very small high-speed, random access, magnetic data stores in computers. Another ferrite material has the property of rotating the plane of polarisation of X-band radiation in a cylindrical waveguide, and can be used in magnetic switches, non-reciprocal attenuators and T-R cells. Another exhibitor has produced even smaller additions to an already highly miniaturised range of components, including toroidal ferrite memory cores of 2 mm diameter wound with up to ten windings comprising a total of several hundred turns of 50, 51 or 52 s.w.g. wire, transistor coupling transformers in a $\frac{1}{4}$in cube and a four-way switch and volume control each of $\frac{7}{16}$in diameter by 0·09in. The trend towards miniaturisation has affected standard precision electrical measuring instruments: a well-known instrument manufacturer showed a five-dial decade vernier potentiometer of very high accuracy and a two-dial thermocouple potentiometer both of which had been reduced to about a quarter of the previously accepted size without any sacrifice in accuracy or precision, and with a considerable saving in bench space.

Semi-conductor devices included improved selenium rectifiers: edge-cooled units are capable of operation at 125 deg C while a modified construction leads to very high specific power output at 50 deg C, and miniature selenium diodes have a maximum reverse voltage of 60 V.

Silicon junction diodes and rectifiers



Silicon diodes were exhibited ranging from high-speed switching types to 30 A power rectifiers; one range was claimed to utilise improved techniques and operate satisfactorily in the range 100 to 200 deg C. On another stand, single crystals of silicon and germanium were shown, the latter weighing over a kilogram. This company's range of products extends from small signal diodes to power rectifiers and junction transistors having power outputs of several watts.

The development of a new piezo-electric material, lead titanate-zirconate, with an electro-acoustic efficiency of 50 per cent has led to greatly improved efficiency in transducers. The new material will also operate at temperatures up to 300 deg C, and if overheated recovers its full efficiency upon cooling. It is claimed to work at loadings of 50 W/cm^2 as against 10 W/cm^2 for barium titanate, and an ultrasonic generator was exhibited making use of this material, capable of operation at 50 kc/s, 225 kc/s or 1 Mc/s, and having an output of 1 kW. Another ultrasonic cleaning equipment utilised pulsed operation at 40 kc/s; output power is 125 W mean and 500 W peak. Perhaps the major application of ultrasonics is still in non-destructive testing, and among the instruments in this class which were exhibited was one in which a square wave of stress is used for thickness measurement or flaw detection in the range 0·02in to 0·5in. All echoes of interest from the rise are recorded before the fall echo commences to interfere.

Another exhibit featured sonoscope presentation, in which scanning combined with a long persistence tube lead to a display consisting of a two-dimensional section of the sample. Another ultrasonic test set, housed in a fibreglass case, is intended for site use. A second channel monitors the echo from the remote boundary of the test object and gives a visible indication of loss of acoustic contact between probe and work surface. A rather different application of ultrasonics is in the measurement of thickness by a resonance method. The thickness is indicated on a calibrated 21in cathode-ray tube, and the provision of facilities for connecting up to 1,000ft of cable between the equipment and transducer makes it suitable for shipyard and oil refinery applications.

The linear accelerator is a device which has previously been employed in order to produce energetic particles for nuclear research: an industrial use for equipment of this kind was demonstrated by a 5 MeV accelerator for industrial radiography which is in production. The accelerator utilises corrugated waveguide, and a crossed cylindrical lens system leads to an effective focal spot of only 2 mm. Other applications include the irradiation of plastics and food sterilisation. Another case of an unexpected use occurs in the determination of refractive index of small sheets of artificial dielectric by means of an X-band interferometer of the Michelson type, a development of that which figured so strikingly in the ether-drift experiments which led to the establishment of the theory of relativity. Measurements of permittivity are made at lower frequencies (up to 1 Mc/s) by inserting the specimen loosely into a prefabricated electrode assembly, measuring the capacitance and then reducing the electrode separation in the absence of the specimen until the same capacitance is obtained. Accuracy up to 1 in 1,000 is obtained without the need either of knowledge of the electrode area or calibration of any capacitors.

Uganda Development Programme

Borrowing Powers Raised to £33 Million

AN extension of the Uganda Electricity Board's 1955-60 development plan was approved by the Legislative Council on 14th March, and the Board's borrowing powers have been raised from £27 million to £33 million. The additional £6 million is required for main transmission and distribution from the Owen Falls station and self-contained schemes for up-country stations too remote to be supplied from Owen Falls.

Capital expenditure by the Board up to 1960 is summarised in the accompanying table, details of the extension programme being given in the second column. Proposed distribution schemes to be supplied from Owen Falls include: Masaka (£200,000), east of Kampala (£313,500), Mityana-Bombo-Kampala (£267,150) and Mbale-Pallisa-Mount Elgon (£280,600). Independent up-country schemes planned are: Fort Portal (£369,000), Gulu (£123,000), Lira (£123,000), Masinda and Hoima (£187,000), Mubende (£92,000), Arua (£70,000), Kabale (£90,000) and Mbarara (£208,000).

CAPITAL EXPENDITURE TO YEAR 1960

Description	Capital Expenditure		
	Previously approved	Additional programme	Total
	£	£	£
Generation:—			
Owen Falls	15,417,000	—	15,417,000
New station investigation	30,000	30,000	60,000
132 kV main transmission	2,185,000	1,608,000	3,793,000
Distribution schemes supplied from Owen Falls	3,929,000	2,806,000	6,735,000
Independent schemes for up-country	—	1,262,000	1,262,000
Buildings	1,960,000	307,000	2,267,000
Transport, tools, etc.	130,000	53,000	183,000
Acquisition expenditure	165,000	—	165,000
Development expenditure (thermal stations)	1,273,000	—	1,273,000
Stock discount and loan expenses	1,478,000	200,000	1,678,000
Total	26,567,000	6,266,000	32,833,000
Deduct Capital Contributions	567,000	90,000	657,000
Net Capital Expenditure	26,000,000	6,176,000	32,176,000

The estimated capital expenditure for 1955-60 also includes provision for the investigation of possible new dams and power stations on the Nile below Jinja. The load upon the Owen Falls station will be substantially increased by sales in bulk to the Kenya Power Company and substantial amounts of power will be needed to meet the growing industrial demand in Uganda, particularly in the Eastern Province. It is thought probable that the Owen Falls output will be fully committed some time in 1964 and the Board may this year approach the Government to seek agreement to construct a second station which might cost some £13 million at present-day prices.

The Board anticipates that after this year, coinciding with the start of the bulk supply to Kenya, its trading account will begin to show a surplus. For 1956 the estimated income is £840,000 and expenditure (including sinking fund and loan charges, etc.), £868,000, leaving a deficit of £28,000 which is covered by the surplus brought forward from 1955. For the following years the estimated revenues and operating results are as follows:—1957, £1,017,000; deficit, £39,000. 1958, £1,364,000; surplus, £87,000. 1959, £1,735,000; surplus, £101,000. 1960, £2,009,000; surplus, £90,000.

LIGHTING FITTINGS MAKERS

Views on the Industry's Future

AT the annual luncheon of the Electric Light Fittings Association on 27th March at the Piccadilly Hotel, London, W., Mr. C. J. W. Scott, president of the Association, was in the chair and Sir Josiah Eccles, deputy-chairman (operation), Central Electricity Authority, was the principal guest.

Sir Josiah proposed the toast of the Association and in the course of his remarks referred to current ideas on monopolies and associations. He said that if trade unions were able to fix their terms of employment manufacturers should not be vilified when they got together to discuss their common technical and economic problems so long as they did not hold the customer to ransom or encourage uneconomic production.

The electrical industry was a great structure providing the power, the plant and equipment to distribute that power and the appliances and fittings for its use. It was the part of the lighting fittings industry to prevent headaches and help to " keep death off the roads " by providing adequate illumination.

After referring to the power situation and the way in which the C.E.A. had caught up with the demand, Sir Josiah said that there had never been a time when co-operation between the suppliers and users of heavy electrical plant had been so close; this had resulted in keeping down the cost of plant per kilowatt. Nuclear energy would make up for the coal deficiency but it would be hard work to master the technique and find the necessary money. The cost of the plant would be two-and-a-half times that of " conventional " plant which meant that much more work for the manufacturers and proportionately more materials and labour. Nuclear power was essential to our future and it would also provide a " shop window " for overseas customers. It was regrettable that the new stations might have to be sited in " unspoilt " areas but the power was necessary for our survival. The C.E.A. would, however, endeavour to meet the appeals of those who wished to preserve amenities, he said.

Responding to the toast, Mr. Scott expressed the Association's pleasure at the well-deserved knighthood bestowed upon Sir Josiah Eccles. He went on to say that 1956 was a prosperous year, with record outputs, for many members. Generally, selling prices and terms had remained unchanged; rising costs had been met by economies in production. The last price increase of any significance had been made in May, 1955. Recent political events had affected the demand and a slight reduction in sales had made it difficult to maintain present prices; rising wages would make it practically impossible. However, the prospects for the industry were very bright.

Trading Policy

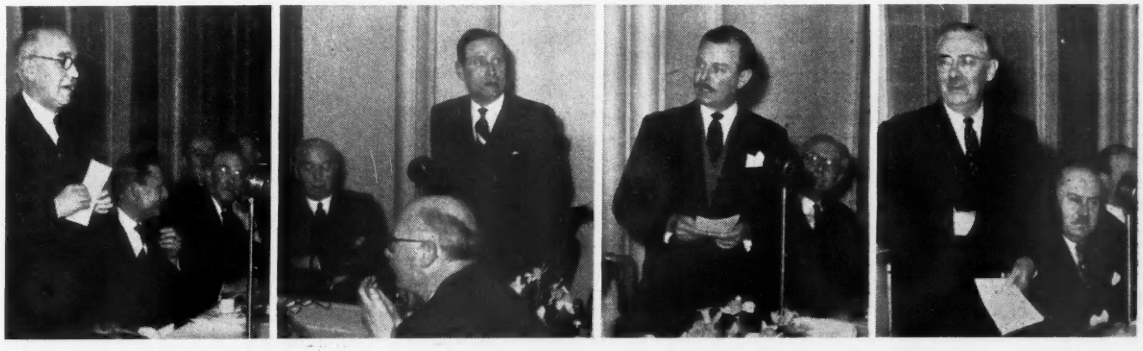
Referring to the Restrictive Trade Practices Act, Mr. Scott said that the Association had registered its constitution and trading policy. E.L.F.A. had nothing to be ashamed of in its practices during the thirty-one years of its existence. But unless they changed their policy they would have to go before the Restrictive Trade Practices Court—here they reserved their defence.

It had been a pleasure to work with Mr. J. G. Christopher in forming the new Electric Lamp Industry Council out of somewhat refractory material. He hoped that E.L.F.A. would find a way to enlarge its membership and produce a trading policy which the whole industry could put into effect. Mr. Scott concluded with appreciative references to the Association's technical committees, Mr. Felix Rogers, the director, and Mr. J. H. Campion, the secretary.

Proposing the health of the guests, Mr. J. J. Thompson spoke of the assistance given to E.L.F.A. by the technical institutions and said that there would be even greater calls upon their aid in the future. In welcoming Mr. Christopher he said that they were all delighted that the lamp makers had got together in their common interest. Mentioning Mr. T. W. Heather, Mr. Thompson said that he had commercial " green fingers " in that all his activities prospered and he especially referred to Mr. Heather's work for the Electrical Trades' Commercial Travellers' Association and the Electrical Fair Trading Council. The speaker also welcomed the past presidents saying that Mr. J. N. Stephens, the first president, was present that day.

Mr. Heather replied for the guests in amusing terms. He said that one could wish for a burst of the light of wisdom upon those concerned to keep costs and prices down and production up which would be a great thing for the country. He praised E.L.F.A. for its consistent

Speakers at the E.L.F.A. luncheon: Sir Josiah Eccles, Mr. C. J. W. Scott (president), Mr. J. J. Thompson and Mr. T. W. Heather



support of the Electrical Fair Trading Council and said that he was gratified as chairman of that Council to have as his vice-chairman Mr. A. E. Iliffe, a past-president of E.L.F.A. He hoped that the Council would be even more effective in the future than it had been in the past.

Annual Report

In his report for 1956 Mr. C. J. W. Scott (Crompton Parkinson, Ltd.), who has been re-elected president of the Association, refers to the effects of the Restrictive Trade Practices Act. He says that the Association's constitution and trading policy have been submitted to the registrar of the Restrictive Trade Practices Court. It is a matter for conjecture when the Court will make a decision and what that decision will be, but the Association's policy for the immediate future continues to be based on the firm belief that stabilised trading is beneficial to the country. The Electric Lamp Industry Council has evolved and registered a new trade agreement and discount structure on liberal lines which has much to commend it and is likely to pass the scrutiny of the Court.

The power given by the Act to individual manufacturers to enforce their own prices may prove more effective than former collective action.

Because of the close alliance between auxiliary gear and lighting fittings for discharge lamps it was thought desirable to combine the activities of E.L.F.A. and the Electric Discharge Lamp Auxiliaries Council. Consequently on 1st January of this year E.D.L.A.C. ceased to operate as a separate body and E.L.F.A. formed a discharge lamp auxiliaries section.

The president reports the continuance of the Association's activities in the fields of standardisation and design and mentions the substantial increase last year in lighting fittings exports and participation in exhibitions.

Discharge Detector

A NEW testing apparatus for measuring the effectiveness of insulation is now being manufactured by Hivolt, Ltd., London, W.11. This a.c. discharge detector, the development of which has been based on twenty years' research by the Electrical Research Association, enables a quantitative assessment to be made of certain conditions within insulation which often lead to electrical breakdown after a period of service under a.c. voltage.

It is well known that insulating material contains minute air bubbles or voids, and that energy is produced if a spark should occur in a void when a material is subjected to high electrical pressure. If the void is small, there is no danger of an explosion as only a minute quantity of energy is produced. With the existence of a large void there is danger of a rapid rise in temperature and an increase in the size of the void, resulting in a failure of the insulation. The energy dissipated in the largest void in an insulation can now be measured, and if this is larger than the "critical discharge magnitude," there is a danger of a breakdown in the insulation. Until now methods of measurement have registered the total energy dissipated in all voids, both below and above the critical magnitude. These measurements have given a false indication of the life of an insulator.

It is now known that failure may be caused by minute discharges which cannot be detected by visual, aural or power factor tests. For insulation which is subject to alternating or pulse voltages in service d.c. discharge detection tests are unsuitable, because recurrent discharges occur at much lower stresses with alternating than with continuous voltage. Overvoltage proof tests with alternating voltage, although indicating no defect, may cause considerable deterioration by discharges. The discharge detector may be used in the development laboratory for determining the operating conditions possible for any desired period of satisfactory service. It can also be used in the factory for the control of manufacturing processes so as to ensure a satisfactory service life for the insulation of manufactured articles. The condition of the insulation of installed equipment can also be assessed.

The apparatus gives a relationship between working voltage, insulation life of material and the type of material. It has already helped to reduce interference by testing polythene insulation of the new transatlantic cable and it can also contribute a great deal to the design of new ultra-high voltage power equipment.

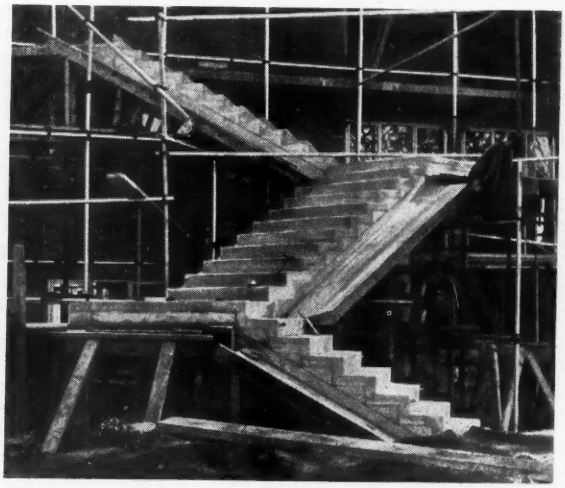
Stair Heating

AN interesting innovation in a group of demonstration houses erected at Muirhouse, Edinburgh, by the Department of Health for Scotland is external stair heating. Designed to function as prototypes for inspection by local authorities, the houses include ideas which are relatively new in Scottish practice and external stair heating is one such idea. The stairs serving the four-storey maisonnettes give access to a balcony at second-storey level. Wm. Allen Smith & Co., Ltd., were responsible for the electrical work.

Reporting on the experimental floor heating of the free standing staircases, the South of Scotland Electricity Board says that the warming of the treads and landings is carried out by electrical low-temperature radiant heating comprising 5·2 kW of p.v.c.-covered heating cable, operating at mains voltage, embedded in the concrete structure. The heating cables used have an average loading of 2·2 W/ft and in order to obtain the requisite loading the cables are spaced at 1in to 1¾in centres. Thus there are from 28 to 34 cables running vertically up the staircase and across the landings. A heavy gauge wire netting is laid overall to provide an efficient earth screen.

To facilitate the pouring of the concrete in one operation it was necessary to lay the heating cables immediately after the fabrication of the steel reinforcement of the staircase, and use was made of this reinforcement to maintain the positions of the heating cables during pouring. The staircase is 4ft 6in wide, but owing to the design of the treads the heating area is limited to a width of 3ft on each tread and this width is maintained also on the landings. As a result, practically the whole of the walking area in both treads and landings is adequately heated. The installation is controlled by a thermostat set to bring the heating into operation when the temperature falls below a predetermined temperature and ensure automatic protection against frost and snow. Because of the thermal capacity of the concrete mass it is anticipated that the installation will operate efficiently on the Electricity Board's "off peak" tariff under which a supply will be available between the hours of 7 p.m. and 7 a.m. and 11 a.m. and 3 p.m.

Electrically heated concrete stairs in course of construction at Muirhouse, Edinburgh



Earthing Systems

Problems in Large Power Stations

THE discussion of the paper on "Earth-Electrode Systems for Large Electric Stations," which was presented before the Institution of Electrical Engineers Supply Section on 27th March by Mr. J. D. Humphries (*Electrical Review*, 29th March), was opened by Mr. L. Gosland (E.R.A.). Earthing problems, he believed, would become increasingly acute as large stations were built in remote places, chiefly characterised by rocky wastes and sandy shores. The design of the earthing system was now regarded as an integral part which had to be attacked in the early stages of planning the station as a whole. Mr. Humphries' paper was the first, he thought, to recommend strongly the use of reinforcement for piling as an earth electrode. It seemed logical, particularly when the reinforced concrete was in satisfactory contact with moist soil, although there were dangers in that, for instance, the concrete might become dry and its resistivity could vary considerably.

Variation of Soil Resistivity

Dr. G. F. Tagg (Evershed & Vignoles) remarked that the author might have laid even more emphasis on the importance of soil resistivity, which varied enormously from place to place, sometimes within a few feet. Also, soil was never homogeneous, and a surface layer of low resistance might cover a layer with much higher resistance. Work was being done which might prove helpful in determining the value of soil resistivity.

Mr. J. H. Gosden (C.E.A.) commented that with steel surrounded by concrete, owing to the oxide film, current could flow in the same way as with a coke electrode. Tests had shown that where the normal limited sections of concrete reinforcement were connected to other structures the currents flowing were small, probably because the cell laid in the steel and concrete polarised readily.

Mr. W. S. Lovely (Merz & McLellan) held that earth electrodes should be used only where really necessary. Inside a power station building or annexed switching station, and similarly in a large industrial set-up, all earth paths should be tied together and made solid. Fault current would choose its own way back unless a path was deliberately made for it. Cables should not be allowed to become chance electrodes, but should be tied in to do some of the carrying of fault current back to neutral.

Mr. W. H. Thompson (Metropolitan-Vickers Electrical Co.) agreed that the earth system should be regarded as an entity. There were two main purposes—the prevention of danger to life and the prevention of damage to the installation; and there were two types of fault—the power frequency fault and lightning. One feature the author might have brought out was that every charged electrical conductor had its own unalterable characteristic voltage distribution through the medium in which it was immersed. One could only keep the potential, and thus the voltage across any given distance, as low as possible. He fully endorsed the author's suggestion that everything should be bonded together.

Mr. L. Czuros (C.E.A.) queried the 430 V limit as a criterion for the efficiency of the earthing system and pointed out that in perhaps 25 per cent of the stations on the British grid this figure was exceeded. Regarding the maintenance of adequate spacing between adjacent electrodes, he pointed out that the overlapping of effective resistance areas for giving the minimum dissipation resistance of nominal fortuitous electrodes and interconnections was unavoidable. The designer must have a clear picture of how far it was worth increasing the number of electrodes for a given site area. With regard to measuring methods, unless the current had a sine waveform, the correction methods used might introduce additional errors.

Mr. P. W. Cave (Evershed & Vignoles) disputed the implication that currents were flowing through the ground looking for an earth electrode. Very largely these currents returned via the sheath and armour of the cables or feeders by an all-metallic path and did not go into the earth at all. With adequate bonding, earthing was of secondary importance.

Mr. W. T. J. Atkins (C.E.A.) said that in his opinion the idealised conception of an earth resistance or dissipation resistance did not correspond with any condition one was concerned with in everyday practice. The individual case must be taken as it stood and the conceptions of ordinary linear circuits could not be applied to something which was spread all over the place and would be materially influenced by the disposition of the various routes. He agreed as to the desirability of bonding anything and everything round electricity supply stations. There had been big earth-fault currents ever since electricity supply began, and there was no need at this stage to panic about them.

Mr. F. Tonge (London Electricity Board) described some of the results of a survey of distribution systems in Italy in 1954 and said that the approach of the Italian engineer engaged on the investigation was similar to that of the author. Earthing was an art as well as a science.

F.B.I. REPORT

THE annual report for 1956 of the Federation of British Industries, which is to be presented to the annual meeting to be held on 10th April, at 21, Tothill Street, London, S.W.1, is indicative of the varied activities of the Federation. Some of these are referred to by the president, Sir Graham Hayman, in his review of the year. In this Sir Graham says that inflation was one of the Federation's main preoccupations and in July last, in agreement with the British Employers' Confederation, a joint statement was issued advocating a policy of price restraint as a contribution to the Government's efforts to bring inflation to an end.

The Federation was deeply engaged in the first half of the year in consideration of the Restrictive Trade Practices Bill, as a result of which the Government adopted many changes to the original draft of the Bill. With regard to the European free trade system, a report submitted by the Federation to the President of the Board of Trade revealed widely differing reactions by trade associations and member firms. The weight of opinion, however, was in favour of negotiations, subject to safeguards against unfair trade practices. Dealing with the shortage of scientists and technologists for industry, Sir Graham says that efforts to get deferment of National Service for honours graduates in science and engineering succeeded towards the end of the year for first-class honours men. The membership of the Federation at the end of the year was 283 trade associations and 7,533 firms.

Engineering in Europe

ABSTRACTS FROM FOREIGN TECHNICAL JOURNALS

IT is difficult to maintain the lightning-safety of a power system at the same (relative) level when transmission voltages, distances and powers transmitted are increased, despite the great amount of valuable work done on the earthing problem during the last 20 years. It would seem that the wider spread of the earthing grids now generally used, and increasing the number of additional rod or tubular electrodes, would be the obvious solution of the problem, but unfortunately it was found that an extended earth cannot be represented, as was first assumed, simply by a homogeneous line with constant and uniformly distributed parameters g, L and r, along which an electromagnetic wave travels. A better representation of the surge characteristics of a long earthing electrode would require the conductivity g along the line to be regarded as varying non-linearly, viz. as a function of the voltage at the point considered. This renders the problem too difficult for analytical treatment and leaves only the electric model method for the solution.

In the model used and described by the authors the most interesting feature is the analogue of the non-linear variable conductivity, represented by a thyrite slab in parallel with a constant resistance. The characteristics of such model elements agree almost ideally with those of driven earth electrodes, while Lr series arrangements placed between two thyrite-resistance shunts are a good representation of extended earths in badly-conducting soils. These demonstrate the rather disappointing fact that the dissipation rate per unit length of an earthing wire falls considerably after the first 20 m length, and also, that the absolute current dissipation of a given length of wire has a limit at about 20 kA per 10 m (this only referring to the first 10 m section of the earthing wire). Many other valuable results for the design of earthing systems were found.—" Surge Characteristics of Extended Earth Electrodes in Badly Conducting Grounds," A. L. Vainer and S. M. Fertik, *Elektrichestvo*, No. 8, pp. 40-47, 1956, in Russian.

Transformer Surge Testing

The surge testing technique is still being developed, and although the general methods are fairly unified, the procedures adopted in different countries vary in details and so do some of the criteria applied and the methods of evaluating the results. The author gives a comprehensive report of the calibration of the surge generator, including the estimating of error limits and setting up of the test programme which consisted of three successive pulses at 1,050, 1,150, 1,250, 1,300, 1,350, 1,400 and 1,450 kV. At the last voltage audible breakdowns occurred which were also confirmed by the oscillograms obtained. Furthermore, the points at which punctures occurred could be approximately located from the oscillograms. Subsequent control pulses at 1,150 kV also led to breakdowns, a few more occurring during the final series of pulses at 1,050 kV.

Valuable conclusions could be drawn on weak points in the design; for example, distribution of the capacitances of the transformer, incorrect placing of potential rings and screens, apart from the sufficiency or otherwise of the winding insulation. The theoretical part of the paper compares the test results as recorded on the oscillograms with the analytical representation of the propagation of the surge waves through an equivalent circuit of the tested transformer and shows that this representation enables the settings of the surge generator to be determined correctly.—" Surge Testing a 100 MVA, 220 kV Transformer to Breakdown of the Insulation of the 220 kV Winding," B. Paderta, *Elektrotech. Obzor*, Vol. 46, No. 1, pp. 8-13, 1957, in Czech.

Dielectric Drying of Cables

A Marx generator with quenched spark gap of 50 kVA rating was specially designed for drying cables weighing up to 4,000 kg. The generator is perfectly screened. The instrumentation for supervising the operation of the spark gap and correct adjustment of the pulse frequency embraces an oscillograph, indicating the voltage of the pilot electrodes. High-frequency current and voltage are measured through instrument transformers and metal rectifiers. A special arrangement chops off excessive and undesirable peak voltages before they reach the cable. The experimental data collected show that about 90 per cent of the water content of the cable paper can be removed within a few hours. This is a great improvement on previous drying periods. A special advantage over drying by current heat is that cables of different sizes and ratings can be dried in a common vat.—" Progress in Dielectric Drying of H.V. Cables," K. Brinkmann and M. Beyer, *E.T.Z.(A)*, Vol. 77, No. 24, pp. 881-884, 11th December, 1956, in German.

Feeder Branching Angles

A problem of some importance, particularly for rural distribution systems, is the choice of the branching angle of feeders going out from overhead lines. This choice may sometimes be dictated by rights of way and the like, in which case the problem does not arise, but where the choice is actually free, there must be an economic optimum solution to it, owing to the fact that, particularly in the case of large consumers, the conductor section of the main line may be reduced behind the branching point.

An investigation has been carried out for distribution systems using steel-cored aluminium conductors, and aluminium conductors for the line and steel for the branching feeders. The results show that the branching angle should always be less than 90 deg, and that its optimum value depends on conductor material, current density and percentage of the total power transmitted branched off at the point considered; it does not depend on the distance of the consumer from the line. The higher the proportion of power branched off, the smaller should the branching angle be. The savings achieved as against right-angle branching by correct choice of the branching angle may be considerable, particularly where the power consumed and the distance from the line are large. Where the optimum angle cannot be used, larger angles are preferable to smaller ones.—" Optimum Branching Angle in Overhead Distribution Systems," V. K. Plyugachev and A. V. Isaenko, *Elektrichestvo*, No. 11, pp. 76-78, 1956, in Russian.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

NEW CHEMICAL FACTORY

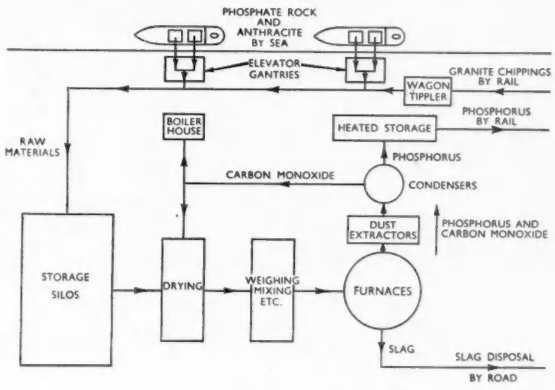
Application of Electricity to the Manufacture of Phosphorus

AT Portishead Albright & Wilson, Ltd., have established a new factory for the production of phosphorus. In addition to a total of about 5,000 h.p. of driving motors there are electric reduction furnaces which constitute the major load.

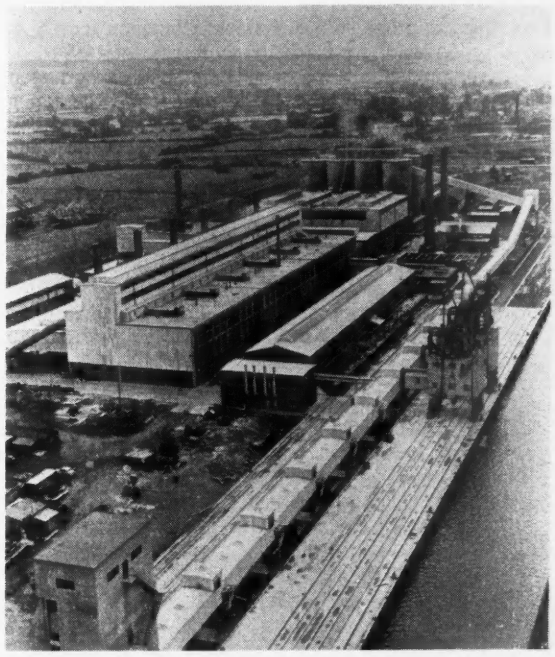
The factory is laid out for an annual output of 40,000,000 lb of phosphorus, a figure greater than the total production of this material in the United Kingdom prior to the commissioning of the plant. The process for the manufacture of phosphorus consists, essentially, of the mixing of calcium phosphate with silica and carbon in an a.c. furnace. At high temperature, the silica displaces phosphoric oxide and forms calcium silicate which is run off as liquid slag. The oxide is reduced by the carbon and the resultant phosphorus vapour and carbon monoxide are then passed over to a condenser where they are separated.

Phosphate rock, anthracite and granite chippings are the principal raw materials used at the factory. Phosphate rock and anthracite are brought to the plant by sea and the granite chippings are carried by rail. Unloading of the ships is carried out by two mobile elevator gantries, each elevator being provided with suction pipes through which the new material is drawn into a hopper on top of the gantry. The material is deposited on a small conveyor belt which transfers it from the gantry to the main conveyor.

Each of the two suction pumps which produce the vacuum necessary for raising the materials from the holds is driven by a 330 h.p. 415 V, 585 r.p.m. G.E.C. slipring induction motor. The incoming granite chippings are unloaded by means of a wagon tippler on to the same main conveyor as carries the other raw materials. The conveyor leads up to the top of a bank of storage silos, comprising eight 100ft circular bins, in which the rock is stored, the spaces between the bins being used to store



Simplified flow diagram



The Portishead phosphorus plant

the anthracite and granite chippings. Unloading of the cargo vessels and the transference of the materials to the storage silos is carried out automatically, the controls being centred in a room at the top of the silos.

When the raw materials are removed from the storage silos for use, they are first dried in calciners and then automatically weighed and mixed. The mix is then carried by belt conveyors to hoppers at the top of the furnace house whence it is gravity fed into the furnaces.

Reduction Furnaces

The furnace house contains six electric reduction furnaces, each of which has a maximum loading of 7,500 kW. Each furnace is supplied from a pair of 4,140 kVA, three-phase, furnace transformers installed in a separate brick-walled enclosure at the back of the furnace platform. The delta-connected winding of each transformer is supplied at 11 kV from the e.h.v. switchboard in the works substation. The star-connected secondary winding has an output of 7,300 A at 180 V. Secondary voltages ranging from 100 to 230 can be obtained by means of two off-circuit tapping switches, one providing coarse and the other fine adjustment. The tapping switch handles are fitted with Castell locks, the key of which is also used in a Castell switch. This switch is arranged to trip the associated circuit-breaker in the substation before the key can be withdrawn, and the breaker cannot be reclosed until the key is returned. Circuit-breaker operation is indicated by means of a lamp.

Transformer cooling is effected by currents of air being forced upwards over the radiators through holes in the floor. Tubular copper busbars connect the transformer with the furnace, and the necessary supplies for metering and control equipment are provided by ring-type current transformers threaded over these conductors. Control boards designed to maintain a constant furnace load are situated at the rear of the furnace platform.

Each furnace is periodically tapped and slag is run out into covered ways where it is allowed to cool before being

carted away by road. Fumes emitted whilst furnace tapping is in progress are extracted by fans driven by 100 h.p., 960 r.p.m. s.r. induction motors.

The mixture of phosphorus vapour and carbon monoxide, which is continuously drawn off from the top of the furnaces, passes through dust extractors to the condensers. Here the phosphorus is cooled to the liquid state while the carbon monoxide is allowed to pass through for use as fuel for the calciners and steam boilers. On leaving the condensers, the liquid phosphorus is piped to heated underground tanks, where it is stored in the molten state until it is pumped into specially constructed railway tank wagons.

A single-storey brick built substation divided into two main sections houses the h.v. and l.v. switchgear, respectively, with two small annexes for the battery and metering equipments. The incoming supply from the South Western Electricity Board is stepped down to 11 kV, and is controlled by duplicate busbar metalclad switchgear having a breaking capacity of 350 MVA.

The high-voltage switchboard consists of seventeen panels comprising three incoming supply units, six units controlling the feeders to the furnace transformers, four units controlling the primary supplies to the auxiliary transformers and four busbar section units. Fireproof segregating walls are built between the front and rear bus-section switches on each section so that, in effect, the board is divided into three parts. The circuit-breakers are of the compact, double-break type and are fitted with side-blast arc control pots. They are arranged for vertical isolation and, when in the isolated position, each breaker can be completely withdrawn on its carriage.

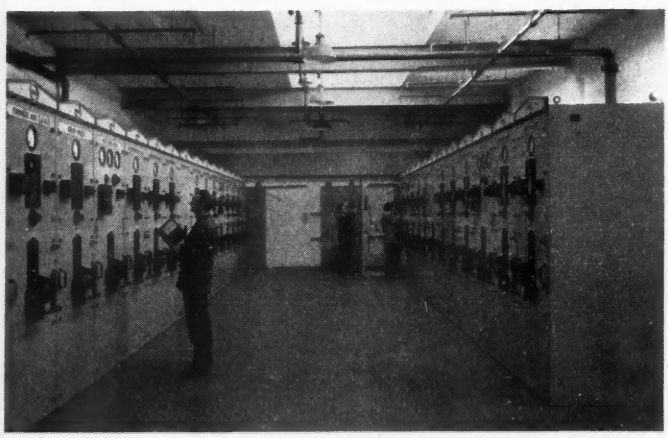
The 1,500 A rectangular busbars are enclosed in compound-filled chambers of fabricated steel construction, and off-load busbar selection is effected by transfer of the circuit-breaker. The circuit-breakers are solenoid operated and are controlled from separate relay and control panels which are situated opposite the associated units. Four 1,000 kVA delta-star-connected transformers, which step the voltage down to 415, are mounted in brick enclosures along one side of the substation.

The l.v. switchgear is of the truck-cubicle type and has a breaking capacity of 30 MVA. There are twenty-nine panels, the switchboard being built in two sections which are installed on opposite sides of the l.v. substation. Each panel is equipped with a hand-operated oil circuit-breaker, four 2,000 A units controlling the incoming supply from the auxiliary transformers, while three further units of the same rating are employed as bus-section switches. The remaining panels, comprising eighteen 600 A units and four 400 A units, are used for feeder control.

Each wheel-mounted truck consists of an angle-iron framework fitted with an enamelled steel front-plate on which are mounted the instruments and relays. The oil circuit-breaker, instrument current transformers and isolating plug contacts are supported on the framework of the truck. The corresponding cubicle is built up of steel plates and is divided into two sections, the rear compartment housing the busbars and outgoing cables. The 2,000 A copper busbars are mounted on porcelain insulator supports, the connections between the two sections of the switchboard being carried in sheet steel trunking fixed to the end wall of the substation.

A panel carrying an indicating mimic diagram of both h.v. and l.v. circuits is mounted on a wall of the l.v. substation, the connections between this panel and the switchgear being made with 32-core, 50 V, telephone-type cable.

The whole of the substation switchgear, metering equipment, transformers, control gear and a large number of motors were supplied by the General Electric Co., Ltd.



The l.v. substation showing the 415 V G.E.C. truck-cubicle switchgear

Rural Electrification Conference

REFERENCE to "misinformed apprehension" regarding the new Electricity Bill's effect on rural electrification was made by the Earl St. Aldwyn, T.D., Joint Parliamentary Secretary, Ministry of Agriculture, Fisheries and Food, at Sutton Bonington, on 27th March. He was opening a three-day Rural Electrification Conference, organised by the Electrical Development Association, at the University of Nottingham School of Agriculture.

Lord St. Aldwyn said that not only was the total number of farms connected increasing but also the rate of connection. In spite of many difficulties, it was likely that the target would be reached ahead of schedule, i.e. before March, 1958, and there was every confidence that the Boards would achieve their forecast for the second five years of connecting 85 per cent of all farms in England and Wales, and a considerably higher proportion of other rural premises, by 1963.

There had been a certain amount of misinformed apprehension with regard to the new Electricity Bill. It was feared that Area Boards would get into difficulties over their rural electricity programmes for two reasons. (1) That they would call a halt because rural electrification generally did not pay. The answer to that was that, by and large, it did pay and the farmers' connections were reasonably sound financial propositions. (2) That the Area Boards would have to retrench the expenses of new installations by cutting down on the provision of new connections. That might have had something in it if any Area Board was not in a perfectly sound financial position, but they were all doing reasonably well. As a long-stop against possible trouble, the Government recently introduced an amendment to the Bill providing that when the central reserve fund was broken up and distributed among individual Boards, special commitments, particularly rural electrification programmes, would be taken into account.

The following papers were given at the Conference:—"Research in Rural Electrification," by Mr. E. W. Golding (E.R.A.); "Load Development in a Large Rural Area," by Mr. W. H. Wills (South of Scotland Electricity Board, Dumfries); "Farm Management and Electricity," by Mr. W. E. Jones (Ministry of Agriculture, Fisheries and Food); "Rural Electrification—Costs and Charges," by Mr. N. F. Marsh (deputy chairman, North Eastern Electricity Board); "Crop Production and Utilisation," by Dr. J. D. Ivins and Dr. J. T. Morgan (School of Agriculture, Sutton Bonington); and "Electricity in Green Crop Conservation," by Mr. P. G. Finn-Kelcey (E.R.A.).

VIEWS on the NEWS

By REFLECTOR

IT is one of the jobs of the Royal Fine Art Commission to pass æsthetic judgment upon public buildings and such things as "street furniture"—a term which includes lamp-posts and lanterns. At Warwick the Commission is in bad odour because it decided recently that other lamps than those suggested were more suitable for Castle Bridge and Coventry Road. The chairman of the Watch Committee is reported by the *Birmingham Post* to have said that they had been left in the peculiar position of having to accept lighting recommended by someone who knew nothing whatsoever about it. He went on to say:—

> "The Watch Committee, street lighting engineers and police are in no doubt about what form of lighting is best, but we have been compelled to accept lighting on the bridge which is inefficient, and in Coventry Road which is extravagant—all in the name of obtaining attractive lighting standards."

These conflicts between beauty and utility are quite frequent. Is it utterly impossible to find lighting systems which are both efficient and attractive?

* * *

Many rural dwellers have to do without electricity because of the expense which would be entailed in taking it to them. But even in the suburbs of London it is not always possible to obtain a supply by just asking for it. *Reveille* reports the case of two streets in the south-eastern area of Greater London which are said to be still in the gas era, although the residents are anxious to have electricity. Apparently these people were on the verge of obtaining a supply in 1939 when the war occurred and put a stop to it. Now the London Electricity Board, it is stated, cannot lay cables when there are existing networks which badly need reinforcement and must have first call upon the restricted funds available. It is a sad reflection of the country's position when an Electricity Board is prevented from making its service available to all.

* * *

Last week I commented on the very different attitudes of the Electrical Trades Union in relation to the television and shipbuilding disputes in which its members are involved. There was an echo of this last Saturday when a television announcer told the viewing public that because of trouble with the electricians, programmes would be affected. But after a five-minute delay normal conditions were resumed—while the shipbuilding and engineering strikes went on.

* * *

Apparently the anxiety of American industry to attract young engineers has led to the offering of salaries quite out of proportion to those paid to experienced engineers. One outcome of this is a demand by the Seattle Professional Engineering Employees' Association that salaries of established engineers shall be increased to make up for the reduction in the "differential" which has developed in recent years between their salaries and those paid to beginners in industry. But, however unsatisfactory industrial salaries may be they are sufficient to tempt senior members of university faculties to leave the scholastic field for industry. According to an article in the *Electrical World* members of these faculties are said to have achieved only a 12 per cent average real salary gain since 1940. The average salary of a full professor is said to buy less than it did then; the general average has risen mainly because most salary increases have gone to beginners for whose services industry has been providing severe competition.

* * *

We are frequently told that technical education in the United States is broader based than in our own country. Maybe it starts earlier there, too, if the reports about Robert Strom are exact. This ten-year-old boy, by stages, became entitled to a prize of $80,000 by answering questions in a television "quiz" in New York. Among the subjects which he tackled was the difference between the piezo-electric and thermionic methods of producing electricity. He went on to win a further $16,000 by explaining the working of a fluorescent lamp circuit. By the time this appears in print he will probably have won a lot more by sketching out a digital computer diagram.

* * *

Nowadays there are occasional complaints about the actions of the electricity supply authorities but there were queerer "goings on" sixty years ago. I take the following account from the *Electrical Review* of 9th April, 1897:—

> "At the South Western Police Court, the County of London and Brush Electrical Engineering Company were summoned by the Battersea Vestry for opening and breaking up the pavement in Trinity Road, Battersea. Mr. W. W. Young, who supported the summons, said the company had provisional orders to light with electricity the parishes of the Wandsworth District Board of Works. The vestry also had an order under which they proposed to light the parish. The company wished to make a short cut from Wandsworth to Clapham, and on a Sunday night, in September last, they surreptitiously opened the roads and laid their mains. The vestry found it out, and made them take them up. Again, in October, they surreptitiously opened the road, also on a Sunday night, and put down a pipe through which it was alleged wires were put to draw through the defendant's cable. The work was not finished until the morning, and in this way it was discovered. The contention was that the work was not carried out by this company, but by another. An official of the company was called into the witness box, and proved that the work was not executed by them. Mr. Young: 'Will you say who did?' Witness declined to answer the question, and the summons was withdrawn."

Yukon River Development

PARTICULARS of a plan to develop the 5 million h.p. hydro-electric potential of Yukon River in the Canadian North-Western area were described to the Institution of Civil Engineers by Mr. J. M. Wardle (consulting engineer to Ventures-Frobisher-Quebec Metallurgical Industries).

The requirement of the Canadian Government is that generating stations and industrial plants using their output shall be in Canada. Surveys were put in hand nearly four years ago. The scheme envisages the reversal of the upper waters, which would be taken through the lower end of Atlin Lake to low valleys in British Columbia, where heads of from 500 to over 1,000ft are available. Development would be in four stages according to the load expected, starting with 250,000 h.p.

Power loads in the area at present are said to be negligible, but it is expected that primary industries would be attracted to the area when cheap power becomes obtainable. The prospects are indicated by the free-world production of aluminium (requiring 10 kWh/lb) which was 2·5 million metric tons in 1954 and was expected to reach 7 to 10 million tons in 1975; each million tons under present processes would need an installation of 2,500 MW. The transition from iron ore to crude steel required 4 kWh/lb; the free world output of crude steel in 1954 was 185 million tons and in 1975 it is forecast at 239 million tons. Canada's installed generating equipment in 1956 was 15,900 MW and the demand expected in 1975 is double this figure. In the United States the 130,400 MW installed in 1955 is estimated to reach 2½ times that amount in 1975.

N.E.S.C.O.E. Association

THE nineteenth annual dinner of the N.E.S.C.O.E. Association (North-Eastern Electricity Supply Company's Old Employees) was held on 28th March at the Conservative Club, Newcastle-upon-Tyne. Sir John Hacking (vice-president) took the chair in the absence of Lord Gridley (president) who was unwell.

The toast of "The N.E.S.C.O.E. Association" was proposed by Sir John Dalton, who referred to the North-East Coast as the cradle of the modern electricity supply industry, on which no company in the world had made a greater impact. The supply undertaking with which he had been connected, the County of London Co., recognised its claim to priority but was proud to have had the same consulting engineers, his personal friends Charles Merz and William McLellan and their successors.

Responding, Lt.-Col. E. H. E. Woodward recalled the first reunion dinner in 1932, at which some of those then present were among the hundred or so attending this year's function.

Proposing the health of "Our Guests," the chairman gave credit to the support received from the manufacturers in the pioneering work of the old supply companies. Much was owed to the Parsons turbine and Sir Claude Gibb was to have been present but had had to go to Canada on business. Sir John Dalton's reputation in connection with the legal aspects of electricity supply had perhaps obscured his earlier technical attainments, such as that displayed in his book on telegraphy published during the first world war. He suggested that Sir John might find opportunities to write more books dealing with successive electricity supply Bills with which the industry seemed likely to be inflicted, presumably as a result of its success.

Response was made by Mr. Houseman, chairman of the Northern Branch of the National Union of Manufacturers, who regretted what he considered over-centralised control from London of industries such as those concerned with coal and electricity. His earliest contact with the Association had been through his friendship with the first president, the late R. P. Sloan.

Thanks were given from the chair to Messrs. S. G. Pike (hon. secretary), H. Sherlock and F. C. Winfield for their part in organising the dinner. Between the speeches Mr. F. Lawson once again entertained the gathering with his greatly appreciated songs given with guitar accompaniment.

The following morning was occupied in visits to either Parsons' or Reyrolle's works and the proceedings terminated with a luncheon given by the directors of the two companies and presided over by Mr. H. H. Mullens.

B.E.A.M.A. Education Conference

THE B.E.A.M.A. Education Committee proposes to hold a one-day conference on education at the Royal Festival Hall, South Bank, London, on Wednesday, 8th May. It will be for representatives of B.E.A.M.A. member firms only, and will aim at assisting those members who have not had much experience of comprehensive schemes of training but wish to ensure that they are adequately staffed in the future.

The programme has been arranged to interest all executives anxious to provide the most suitable forms of education and practical training for their technical employees of all grades. The programme is essentially a practical one, consisting of the following papers:—"Recent Developments Affecting the Patterns of Craft Technical and Technological Training," by C. Grad, manager, B.T.H. Education Department; "The Training of Technicians in the Medium-Sized Firm," by W. H. Temple, personnel controller, G.E.C.-Osram Group; "The Training and Employment of Women at Technical Level," by G. S. Bosworth, chief technical personnel and education officer, English Electric Co., Ltd.; "Joint Training Schemes in Medium-Sized Firms," by J. E. C. McCandlish, organising secretary, Scottish Electrical Training Scheme; and "The Problems and Costs of Industry-Based Sandwich Schemes," by R. F. Marshall, manager, Education Department, Metropolitan-Vickers Electrical Co., Ltd.

There will be ample time for discussion and interchange of experience. The fee for each delegate is three guineas inclusive of lunch, morning coffee, and afternoon tea. The chairman of the conference will be Mr. J. O. Knowles, vice-chairman of the B.E.A.M.A. Council.

Application forms and further details may be obtained from Mr. James Oldroyd, secretary, British Electrical and Allied Manufacturers' Association, 36, Kingsway, W.C.2.

Electrical Industries Club

THE third annual meeting of the Electrical Industries Club was held last Tuesday at the Connaught Rooms, London, W.C.2. In the annual report which was presented mention was made, *inter alia*, of the ladies' luncheon (which is to be repeated) and the E.I.C. golf competition. A total of £193 was collected for the E.I.B.A. during the year. Membership at the end of last year was 270, thirty-two new members having joined.

As we have already reported, Mr. Leslie Gamage is being succeeded as president by Mr. A. F. Plummer. As the result of a ballot of members Messrs. R. Baldwin and N. H. Codling were re-elected to the committee and Messrs. C. B. Cleland and R. W. Holledge were elected members.

The new vice-presidents are Messrs. E. G. Batt and A. C. Wildsmith. Mr. H. F. Wickham continues as hon. social secretary and Mr. A. S. Lowe is to act as hon. treasurer as well as hon. secretary, Mr. H. Senior Fothergill having retired from the former position.

It was decided to organise another golf competition, the date chosen being Wednesday, 5th June.

At the subsequent luncheon Mr. Gamage presided. Mr. Batt, on behalf of the members, presented him with a finely-bound first edition of Sir John Hunt's "Ascent of Everest" in recognition of his services to the Club. Mr. Gamage thanked the members and introduced his successor, Mr. Plummer, who expressed his appreciation of his election as president in a witty speech.

Mr. Batt announced that at the next luncheon, in May, there would be a speaker from Associated Television Rediffusion.

Large Railway Contracts

THE British Transport Commission announces the placing of contracts, of a total value of about £6 million, for sixty complete main line electric locomotives and forty electrical equipments; the latter will be used in locomotives to be built in British Railways workshops. This is the third series of major contracts in connection with the electrification of British Railways to be announced this winter.

The locomotives now ordered are primarily intended for use on the Crewe-Manchester and Crewe-Liverpool lines, which form part of the electrification programme in the London Midland Region. They are of two mixed traffic types: Type A, designed to haul express passenger trains of up to 475 tons at speeds up to 100 m.p.h., or mineral trains of up to 950 tons at 55 m.p.h.; and Type B, having a maximum speed of 80 m.p.h. but capable of hauling mineral trains of up to 1,250 tons at 55 m.p.h.

Contracts for these two types have now been placed as follows:—

	Type A	Type B
British Thomson-Houston Co., Ltd.	20	5
English Electric Co., Ltd.	10	5
General Electric Co., Ltd.	5	5
Metropolitan-Vickers Electrical Co., Ltd.	5	5
	40	20

The British Thomson-Houston Co. has also received the contract for the forty electrical equipments for locomotives to be built in British Railways workshops.

Delivery of the locomotives is due to begin towards the end of 1958 and to be completed during 1960.

Both Type A and Type B locomotives will be of 3,300 h.p. continuous rating; the difference between the two types lies in their gear ratios. All the locomotives will be of the Bo-Bo type (eight wheels), with 20-ton axle loads, and with driving cabs at either end. They will conform to the B.R. standard loading gauge and will be suitable for duties on all regions. A wide range of standardisation will be obtained, including standard pantographs and circuit-breakers for all makes, while the layout of the driving cabs will be identical in all the locomotives. Their external appearance (in regard to which the Commission's recently-established Design Panel will be consulted) will also be substantially the same.

The new locomotives are designed to operate on the 25 kV, 50 c/s a.c. system which the B.T.C. has decided to adopt as standard for future electrification. D.c. traction motors will be used, employing direct current supplied by transformers and rectifiers on the locomotives, with speed control by tap-changing. The motors will be carried on the bogie frames and will have fully-flexible drive to the wheels, instead of being axle-hung. The electrical equipments will allow for the development of full power at both 25 kV and 6·6 kV. The possibility is being considered of using germanium-type rectifiers on some of the locomotives to be supplied by the British Thomson-Houston Co., Ltd.

The Metropolitan-Cammell Carriage & Wagon Co., Ltd., Saltley, Birmingham, are to be the main contractors for the design and construction of the five high-speed diesel-electric de-luxe trains the first of which, as recently announced by Sir Brian Robertson, chairman of the British Transport Commission, are planned to be put into service on British Railways in 1958.

These all-Pullman trains will run between Manchester and London (St. Pancras), in the London Midland Region, and between Bristol and London (Paddington), and Wolverhampton, Birmingham and London (Paddington), in the Western Region. Two 6-car trains, for first-class passengers only, will be built for the Manchester-London service, while for the Western Region services three 8-car trains will be constructed with accommodation for first- and second-class passengers. All the trains will be air-conditioned and have heat and sound insulation, the passenger portion of all vehicles being fully enclosed, with double-glazed windows.

The traction equipment will be manufactured by the General Electric Co., Ltd., with 1,000 h.p. diesel engines (each train will have two such engines) by the North British Locomotive Co., and auxiliary engines by Rolls-Royce. There will be two power cars in a train, each with a machinery compartment containing a N.B.L./M.A.N. 1,000 h.p. pressure-charged vee 12-cylinder engine direct-coupled to a G.E.C. single-bearing main generator with belt-driven auxiliary generator. Eight self-ventilated traction motors will be distributed through the train. The control system will comprise a combination of main generator field control and engine speed variation, with automatic torque control through an oil servo-regulator. A range of several engine speeds will be provided by means of three air-operated pistons acting on the engine governor through a system of interconnected levers.

The "Loudaphone" communication system will be installed between the driver and the guard.

Letter to the Editor

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents

Engineering Status

YOUR editorial in the issue of 22nd March is most enlivening but, I suggest, does not go far enough. You leave it to the last paragraph to mention in passing a point which, to my mind, is at least as important as education. I refer to "a common misuse of the term engineer."

Professional men in law, medicine and architecture are, I think, the only ones who are at present protected by law against misuse, common or otherwise, of their professional nomenclature and it is an indictable offence for anyone not so qualified and registered to call himself a barrister, solicitor, physician or architect.

Surely, with the phenomenal growth of engineering in this country, it is more than ever an urgent necessity to put an end to this loose state of affairs. It is a matter of the utmost importance that the principal engineering institutions get together a working committee with a view to promoting legislation, possibly on lines similar to the Architects Registration Acts, to restrict the title of engineer to those professional men who are, by training and examination, qualified to use it. The thousand and one classes of men who misuse the title "engineer" and, in so doing, unwittingly mislead the public, will then fall into proper perspective.

London, W.1. E. C. INSTON,
Liaison Officer in the United Kingdom,
Electricity Corporation of Nigeria.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Mr. D. Taylor, Ph.D., M.Sc., B.Sc., head of the Electronics and Instrument Division of the Atomic Energy Research Establishment, Harwell, has been appointed a director and general manager of Plessey Nucleonics, Ltd. In addition he will become research executive of the aircraft and electronics groups of the Plessey Co., Ltd., and will be responsible for the co-ordination of the company's nuclear programme.

Dr. D. Taylor

Dr. Taylor, who will take up his new appointment on 1st May next, was educated at the Riley High School, Hull, and at the University of London. Between 1931 and 1939 he held a number of university lectureships in electrical engineering and physics. In 1939 he joined the Air Ministry as a scientific officer, and later played a leading part in the development of radar at the Telecommunications Research Establishment—now the Radar Research Establishment—where he held the position of superintendent. He went to the Far East in 1944, in charge of a radar development unit, to assist the R.A.F. and Fleet Air Arm. After the war Dr. Taylor rejoined the Telecommunications Research Establishment, but was soon appointed head of the Electronics and Instrument Division, A.E.R.E., Harwell, a position he has held for the past twelve years. His association with the Research Establishment will be maintained as a part-time consultant.

Dr. Taylor is a member of the Council of the Institution of Electrical Engineers and chairman of the Measurement and Control Section of the Institution. He is the author of many scientific papers on radar, aerial systems, nuclear instruments, reactor control, etc., and has also published several books on these subjects.

Continuing its policy of establishing a two-tier organisation by the division of its Area into some 14 or 15 enlarged Districts each responsible to headquarters, in place of the present three-tier structure of headquarters, Sub-Areas, and Districts, the East Midlands Electricity Board has decided to amalgamate the Mansfield and Worksop Districts from 1st April. **Mr. A. Latham,** M.I.E.E., manager of the present Mansfield District, has been appointed manager of the new District which will be known as the Mansfield and North Nottinghamshire District. It will cover an area of 545 sq miles with approximately 106,000 consumers and the district offices will be at Mansfield.

Mr. D. Youdan, the present manager of the Daventry District, has been appointed manager of the Bletchley District with effect from 1st April and for the time being the Daventry District will be administered by the Northamptonshire Sub-Area.

Mr. L. H. Thompson, F.C.W.A., F.A.C.C.A., who has been assistant chief accountant (financial accounts) at Mapperley Hall since vesting date, left on 29th March to take up an appointment as accountant/secretary of the Bahamas Electricity Corporation.

Following the acquisition by Elliott Brothers (London), Ltd., of the share capital of Associated Insulation Products, Ltd., **Mr. L. W. Farrow** and **Mr. O. W. Thesiger** have joined the board of Elliott Brothers (London), Ltd.

Mr. R. Catherall has been appointed a director of the Solartron Research & Development, Ltd. On 26th March he left for the United States on a two months' visit to the Consolidated Electrodynamic Corporation, Pasadena, California, for whom the Solartron Electronic Group acts as sole selling agents in the United Kingdom. He will study the American techniques in data processing. Mr. Catherall joined the Solartron Group in 1952 as a senior scientist in charge of the design of electronic instruments. Previously he had four years with Smith Aircraft Instruments, Ltd., being concerned with auto-pilot development.

Col. R. E. Keelan, O.B.E., M.C., T.D., A.M.I.E.E., manager of the G.E.C. Witton Engineering Department in London, has retired after nearly fifty-one years' service with the company. **Mr. A. E. Taylor,** formerly deputy sales manager (home sales) at Witton Engineering Works, has been appointed to succeed him as manager in London.

Col. R. E. Keelan

Col. Keelan, who was born in India, joined the G.E.C. as an apprentice at the Witton Engineering Works in 1906. In 1911 he was appointed head of the Test Department. After serving with the Royal Engineers in the 1914-18 war he was appointed chief engineer for the company in Scotland, until 1938 when he was transferred to London as manager of Central Stations Department. He served again in the last war, and on his return from the Army in 1945 he was appointed manager of Witton Engineering Department in London.

Gen. Sir William D. Morgan, G.C.B., D.S.O., M.C., has resigned from the boards of Associated Electrical Industries, Ltd., Siemens-Ediswan, Ltd., Siemens Brothers & Co., Ltd., and the Edison Swan Electric Co., Ltd.

Mr. J. H. Hansard has joined the board of Electric & Musical Industries, Ltd.

Mr. H. Peters has been appointed the new Exeter area superintendent of the A.E.I. Lamp & Lighting Co., Ltd. Mr. Peters joined the B.T.H. Co. at the Rugby Lamp Works in 1912 and worked in the Sales Department of the company in Birmingham and Sheffield. Later he opened the B. T. H. Hull depot and became manager, lamp and lighting sales, in Leeds, and then Cardiff. Mr. Peters is chairman of the Exeter and Devonshire Branch of the E.I.B.A., is past chairman of the Exeter Branch of the I.E.S., and was first president and a founder member of the Exeter Electric Club.

Mr. H. Peters

The British Engine, Boiler & Electrical Insurance Co., Ltd., has appointed **Mr. W. McDermott,** B.Sc.Tech., M.I.E.E., senior assistant electrical engineer, to be chief electrical engineer in succession to **Mr. D. C. Bacon,** M.I.E.E., who retired at the end of March. Mr. McDermott is a member of the I.E.E. North Western Centre Committee and is on the Codes of Practice Committee for Electrical Engineering.

Mr. H. Gibson, manager of the Sheffield sales office of Brook Motors, Ltd., for twenty-six years, retired at the end of March. **Mr. B. Sykes,** A.M.I.E.E., formerly technical sales engineer at Sheffield, takes over as manager. He is a former Brook

Mr. H. Gibson

Mr. B. Sykes

Mr. E. Nicholson

apprentice, has eighteen years' service with the company, and was employed in the Load Testing Department and at the Liverpool office before taking up his position at Sheffield. Another Brook apprentice trained salesman, **Mr. E. Nicholson,** has moved to Sheffield as sales engineer. Mr. Nicholson was formerly in the Huddersfield sales office.

Mr. G. C. H. Matthey has been elected chairman of Johnson, Matthey & Co., Ltd., following the recent death of Mr. H. W. P. Matthey. Mr. G. C. H. Matthey was appointed a joint managing director of the company in 1913, and served in this capacity for thirty-five years.

At the annual general meeting of the British Refrigeration Association on 22nd March, **Mr. D. S. Carruthers** (L. Sterne & Co., Ltd.) was elected chairman and **Mr. E. G. Rowledge** (Pressed Steel Co., Ltd.) vice-chairman.

Mr. S. Southall, works manager of Campbell & Isherwood, Ltd., electrical engineers, Bootle, retired on 30th March after forty-nine years' service with the company. At a dinner in his honour, Mr. H. Campbell (chairman) presented Mr. Southall with a picnic set from the staff.

Mr. T. S. Dickinson, A.M.I.Mech.E., A.M.I.Prod.E., has been appointed chairman and managing director of the General Engineering Co. (Radcliffe), Ltd., following the death, in January, of the former chairman, Mr. S. Taylor, M.B.E. Mr. Dickinson joined the company in 1921, was appointed technical director in 1944, and joined the board in 1946. He is president of the North Western Section of the Junior Institution of Engineers.

Mr. T. S. Dickinson

The toast to the Institution, at the annual dinner and dance of the Western Centre of the **Institution of Electrical Engineers** on 29th March, at the Grand Spa Hotel, Clifton, was proposed by Sir Philip Morris, the Vice - Chancellor of Bristol University, and Sir Gordon Radley, President of the Institution, in responding, said that engineers had to take up the new scientific knowledge and turn it into services which could be used or goods which could be sold, if we were to keep our position in the world and maintain our standard of living.

Mr. M. J. J. Richards has been appointed manager of the London branch sales office of the British Aluminium Co., Ltd., at Park Avenue, North Circular Road, London, N.W.10, with effect from 16th May, in succession to **Mr. W. J. Allen,** who retires from the company's service on that day.

Mr. G. F. Peirson, M.I.E.E., M.Amer.I.E.E., whose appointment as deputy chairman of the Midlands Electricity Board is announced by the Minister of Power, has been the Board's chief engineer since 1948. He succeeds **Mr. D. P. Sayers,** who, as we recently reported, has been appointed as chief contracts officer of the Central Electricity Authority.

Mr. G. F. Peirson

Mr. Peirson was educated at King Henry VIII School, Coventry, and at Birmingham University. From 1934 he served in progressive posts on the staff of the former Midlands Electricity Corporation for Power Distribution, Ltd., until his appointment as the company's chief engineer in 1944. In 1947 Mr. Peirson visited the United States to study American electricity supply techniques.

On nationalisation in 1948 he was appointed manager of the South Staffordshire and North Worcestershire Sub-Area of the M.E.B. but after six months in this post he became the Board's chief engineer. He was one of the two chief engineer representatives on the British Electricity Research Council, serving on the Council for six years after its inception. He was president of Birmingham Electric Club for two years, from 1951 to 1953. Mr. Peirson was chairman of the Supply and Utilisation Group of the South Midlands Centre of the Institution of Electrical Engineers in 1953-54. He is chairman of the Switchgear Committee of the Chief Engineers' Conference and in that capacity serves on the Joint Switchgear Sub-Committee of the Electricity Boards and B.E.A.M.A. He is one of the Electricity Boards' representatives on several B.S.I. Switchgear Committees and has been for a number of years a delegate to meetings of the International Electro-Technical Commission. Following the report of the Anglo-American Productivity Committee in 1949, Mr. Peirson sponsored pioneer experiments in this country on auto-reclosers and live-line working. He was chairman of the Area Boards' V.H.F. Radio Committee. He later became chairman of the Joint Radio Committee of the nationalised fuel and power industries. He was chairman of the Birmingham Committee of the E.D.A. in 1948.

Owing to ill-health **Mr. Alan Kiernan,** M.I.Mech.E., M.I.Prod.E., has relinquished his appointment as assistant managing director of Edward G. Herbert, Ltd., and has retired from the service of the company. He retains his seat on the board.

Due to pressure of work **Mr. G. Wray,** O.B.E., A.I.M.T.A., D.P.A., F.S.S., has relinquished his duties as secretary of the South Eastern Electricity Consultative Council and he has been succeeded by **Mr. C. J. White,** A.C.I.S., D.P.A.

Mr. T. O. Orr has been appointed sales manager of Air Pumps, Ltd., and will operate from the company's World Sales Department at 8, Francis Street, Westminster, S.W.1. Mr. Orr recently resigned from Sumo Pumps, Ltd.

In our report of the Electrical Wholesalers' Federation dinner in last week's issue we referred to the impending retirement from the E.W.F. directorship of Mr. A. B. Wildsmith, mentioning that his successor would be Mr. C. M. Etherington. Actually it is **Mr. P. B. Etheridge** and we apologise to both gentlemen for our error.

Mr. A. J. Nicholas, O.B.E., M.I.E.E., joint managing director of Aberdare Cables (Holdings), Ltd., and managing director of South Wales Switchgear, Ltd., has taken office as president of

Mr. A. R. C. Huntington, the retiring president, installing Mr. A. J. Nicholas, managing director of South Wales Switchgear, Ltd., as president of the Industrial Association of Wales and Monmouthshire

the Industrial Association of Wales and Monmouthshire for the ensuing year.

Taylor, Tunnicliff & Co., Ltd., announce the appointment of **Mr. J. V. Cooper** and **Mr. W. S. Mansfield** to the board.

Mr. H. V. Potter, chairman of Bakelite, Ltd., has been elected president of the British Plastics Federation for the 1957-58 session, and **Mr. C. C. Last** (Bakelite) and **Mr. N. B. Punfield** (Punfield & Barstow) have been elected chairman and vice-chairman respectively.

On his retirement on 29th March after 44 years with the company, **Mr. Charles J. H. Stevens,** F.R.S.A., manager of the Cable Accessories Department of Johnson & Phillips, Ltd., was presented with a cheque by the directors in appreciation of his long and valuable service. He joined J. & P. in 1913, interrupting his career at the outbreak of the 1914-18 war to

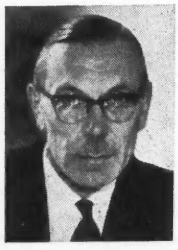
Mr. C. J. H. Stevens (left) receiving a cheque from Mr. W. Glass, joint managing director of Johnson & Phillips, Ltd.

volunteer for service in the Royal Artillery. He returned to the company in 1919 and later became chief draughtsman of the Junction Box Department, of which he was appointed manager in 1930.

Mr. S. J. Kitney, who has been chief draughtsman of the Cable Accessories Department since 1930, has been appointed acting manager. He has recently been concerned with the special connecting boxes designed for the transatlantic telephone cable to Newfoundland.

Mr. R. G. Sell, B.Sc.(Eng.), M.I.E.E., A.M.I.Mech.E., chief assistant to the contracts manager of British Insulated Callender's Construction Co., Ltd., has been appointed assistant (fixed equipment), Electrical Engineering Department, British Transport Commission, and took up his new duties at the beginning of this month. Mr. Sell was appointed senior assistant to the divisional manager (sales and engineering rectifiers), Westinghouse Brake & Signal Co., in 1950, before which he had served with the company in various capacities. In 1952 he became senior assistant to the chief engineer, British Insulated Callender's Cables, Ltd., and in 1954 was appointed chief assistant to the contracts manager in the Submarine Cable Department of British Insulated Callender's Construction Co.

Mr. A. H. Harris, A.M.I.E.E., has been appointed deputy engineer-in-chief of Cable & Wireless, Ltd., as from 1st April. He succeeds Mr. C. J. V. Lawson, M.I.E.E., M.I.R.E., who, as we have already reported, has been appointed engineer-in-chief in succession to Mr. J. A. Smale, C.B.E., A.F.C., B.Sc., M.I.E.E., who has retired.



Mr. A. H. Harris

Mr. Harris joined the Eastern Telegraph Co. in 1922 and transferred to Cable & Wireless, Ltd., on the merger of British overseas telegraph undertakings in 1929. He was serving at Sharp Peak at the time of the Japanese attack on the U.S. Pacific Fleet at Pearl Harbour, but escaped to the Chinese mainland with the manager, Mr. R. C. Hampton. Mr. Harris served at the Aden and Carcavelos stations for the next five years, but in 1945 returned to the United Kingdom and in recent years he has been head of the Cable Circuit (Operation and Maintenance) Section of the Engineer-in-Chief's Department in London.

Mr. J. A. Smale, C.B.E., A.F.C., B.Sc., M.I.E.E., who retired from the post of engineer-in-chief of Cable & Wireless, Ltd., at the end of March, has been appointed technical consultant in telecommunications engineering to Marconi's Wireless Telegraph Co., Ltd. Mr. Smale began his association with Marconi's in 1919. In 1921 he was responsible for the installation in the City of London of the first central telegraph office for wireless circuits, while by 1924 he had designed and tested equipment for frequency-shift keying. Among his other notable engineering achievements is his work on the transmission of pictures by wireless, his experiments leading to the adoption by Scotland Yard of radio photo-telegraphy as a routine method of sending fingerprint facsimiles to overseas police forces. He was also responsible for the design and manufacture of the first voice-frequency channelling system used commercially in this country and for the design (in 1928) of an h.f. wireless receiver which formed the basis of design of many later commercial receivers. Mr. Smale transferred to Cable & Wireless, Ltd., in 1929, joining the Engineer-in-Chief's Department in 1932 and becoming engineer-in-chief in 1948.

Mr. J. A. Smale

The **Portland Players** (C.E.A. Sports and Social Club) are presenting Somerset Maugham's "The Noble Spaniard" on 11th and 12th April, at the Portland Hall, Tichfield Street, W.1.

The Dowager Lady Swaythling, O.B.E., president of the Electrical Association for Women since 1938, has relinquished this office and is succeeded by **Viscountess Kilmuir,** D.B.E., who has been president of the Liverpool Branch since 1951. This announcement was made at the annual luncheon of the Association in London on Wednesday when Miss Norah Balls, J.P., chairman, presented an electric toaster to Lady Swaythling.

Lady Swaythling has long been associated with the E.A.W., for she was hon. treasurer from 1931 to 1938, and throughout her 26 years of office there have been few official functions of the E.A.W. which have not been graced by her presence. She has a long record of public service. Viscountess Kilmuir, wife of the Lord Chancellor, takes a keen interest in social work of all kinds.

Mr. R. H. Gill has been appointed as this year's chairman of the Leicester Branch of the E.C.A., with **Mr. C. H. Bromley** as vice-chairman. **Mr. L. W. Harrison** is the secretary.

PRICES OF MATERIALS

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £197 0s 0d
COPPER, H.C. Electro	ton £245 10s 0d
Fire Refined 99·7%	ton £244 0s 0d
Fire Refined 99·50%	ton £243 0s 0d
COPPER Tubes ..	lb 2s 4½d
Sheet	ton —
H.C. wire and strip ..	ton £289 5s 0d
LEAD, English	ton £112 10s 0d
Foreign	ton £111 0s 0d
MERCURY	flask £86 0s 0d
TIN, block (English) ..	ton £778 10s 0d
ZINC, G.O.B. Foreign	ton £97 10s 0d
Electrolytic	ton —
BRASS Tubes (solid drawn)	lb 1s 11⅞d
Sheet	ton —
Wire	lb 2s 8⅜d
PHOSPHOR BRONZE Wire	lb 4s 0¼d
PLATINUM	oz £34 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 27d—27⅛d

PARLIAMENTARY REPORT

Grants for Farm Installations

Direct grants for the modernisation of farms, including the provision of electric light and power, will be made under the Agriculture Bill which is now before the House of Commons. Introducing the Bill, the Minister of Agriculture, Mr. Heathcoat Amory, said these grants would normally be given at a flat rate of one-third of the reasonable cost, the object being to promote really economic improvements. He said that to-day agriculture was a modern, technical industry, and needed up-to-date equipment and modern tools. The Bill provided that applications for grants could be made within ten years of its becoming operative, which they hoped would be on 1st September, 1957, and it was estimated that the cost would be £50 million for the ten years.

Mr. W. Whitelaw welcomed the application of the grants to electric power and light, saying he had been left in no doubt, by the farmers who were still waiting, about the value of electricity on farms. He regretted that improvements to farm cottages had not been made eligible for the grant because he believed there would be much more progress if rural housing improvements were administered by the Ministry of Agriculture rather than local authorities.

Mr. Sydney Dye agreed that any grant made for taking electricity to the farms should include supplies for the cottages as well. They should be treated as an essential part of the farm. It would be utterly wrong for the farmer to be able to modernise his buildings and install electricity in them while the cottages remained unmodernised and without electricity. This was a flaw in the Bill.

Mr. Douglas Marshall asked the Government to extend the scheme to the horticultural industry. He saw no reason why grants should not be given for heating units used in horticulture, and for making glasshouses into more economic units by modernisation and alterations.

Mr. J. B. Godber, Parliamentary Secretary, Ministry of Agriculture, replying to the debate, said that the grants for electricity supply would be equally applicable to horticulture as to agriculture.

Distribution of Industry

Replying to a debate in the House of Lords on the distribution of industry, Lord Mancroft, Parliamentary Secretary, Ministry of Defence, said the Government had not made up their minds about possible improvements for the working of the Distribution of Industry Act; they would take note of all the suggestions. The siting of the new atomic power stations was a difficult problem. He would not go into the subject because the House would be debating it again shortly. He admitted that the Minister of Power had a free hand and did not need to get planning permission, but there was the closest link between him, the Board of Trade and other Ministers concerned. Lord Mancroft rejected a suggestion that there should be an inquiry into industrial distribution. He said the Government could carry out the review from the information they already had available. The policy of assisting industrial development was constantly being reviewed. This Act was only one facet of the planning which was going on to meet the new conditions of the future.

Nuclear Stations' Output

Mr. Osborne asked the Paymaster General if he would give details of the latest type of atomic power station designed to be ten times more powerful than Calder Hall.

Mr. Maudling replied that the nuclear power stations now being built for the electricity authorities were expected to have about four times the electricity output of the first Calder Hall station. A further increase in output as a result of straightforward engineering development could already be foreseen, and if a number of technical problems could be solved a station with about ten times the electrical output of Calder Hall might be feasible, but no such station had been designed yet.

Bricks from Fly-Ash

Asked by Mr. Dodds what conclusions had been reached on making bricks from a mixture of fly-ash from power stations and clay, the Minister of Works (Mr. Hugh Molson) said the application to large-scale production of these techniques was a matter for individual firms of whom there were 700 engaged in brick production and he had no information on the matter. He understood from the Central Electricity Authority that in 1956 some 25,000 tons of ash from power stations was so used and the amount appeared to be increasing.

Report on Valves and C.R. Tubes

Sir David Eccles informed Mr. Oram that the terms of reference of the Monopolies Commission in reporting on electronic valves and cathode-ray tubes were varied so as to avoid overlap with the functions of the Restrictive Practices Court.

Mr. R. Jenkins said it appeared from the report that one firm in this industry was a single-firm monopoly. Could not the Government do something about the practices of this firm, which were not, even under the new Act, matters for the Restrictive Practices Court? Sir David Eccles said he did not think that was so, but if it was he would certainly consider it.

Charges for Electricity Connections

Sir David Robertson asked the Secretary of State for Scotland whether, in view of the North of Scotland Hydro-Electric Board's demands for premiums for electricity supplies to crofters and other consumers in the Highlands, he would require the Board to regard these costs as capital charges to be met by the Board and written off over a period of years.

Mr. Niall Macpherson, Under Secretary, said it was for the Board to decide how much of the cost of connection it could meet in each case. The Board's share of the cost was already regarded as a capital charge and written off over a period of years.

Detection of Fish Shoals

Replying to Mr. Hector Hughes, Mr. Godber, Parliamentary Secretary, Ministry of Agriculture, said that an air charter firm and a manufacturer of electronic equipment had been conducting preliminary trials in locating shoals of fish with a special echo-sounder towed from a helicopter. If the experiments were successful the firms intended to provide a commercial service.

Restrictive Practices Act

Mr. E. Fletcher asked the President of the Board of Trade how many agreements had been registered under Section 10 of the Restrictive Trade Practices Act, 1956.

Sir David Eccles said the Registrar had stated that about 1,200 agreements had been sent to him by the end of the first registration period on 28th February.

Domestic Refrigerator Sales

Captain Kerby asked the President of the Board of Trade if he was aware that his imposition of the 60 per cent purchase tax and 50 per cent hire-purchase deposit on domestic refrigerators had so narrowed the home market sales that manufacturers were unable to produce in sufficient quantity to bring down production costs, with the result that it was impossible to export large quantities of refrigerators to Canada, at competitive prices, without incurring the high Canadian anti-dumping duty which operated if the manufacturers' list price, less allowed discounts, was any lower than the British list price.

Sir David Eccles said he was aware of the arguments put forward by this, as well as by other, industries against these measures. The relaxation of

existing restraints must however depend on our success in improving our general economic position. Meanwhile, he was glad to say that the industry had succeeded in maintaining a high level of exports. In particular, there has been no marked fall in exports to Canada. The figures were:—Exports of domestic refrigerators to Canada—1955, £87,222; 1956, £85,498. Total exports of domestic refrigerators—1955, £7,610,000; 1956, £6,796,000.

Hire and Hire-Purchase Agreements

Mr. Cronin asked the President of the Board of Trade when he would introduce the measure, promised in the Queen's Speech, to replace the existing emergency powers in respect of hire-purchase and hiring agreements and to regulate borrowing by hire-purchase finance companies.

Sir David Eccles said the Government had decided that the second of these questions required further study and a Bill could not, therefore, be introduced this Session.

Trade with Cuba

In answer to a question by Mr. Russell, the President of the Board of Trade (Sir David Eccles) gave details of increases in United Kingdom trade with Cuba in 1956 as compared with 1955 and said the Government hoped that the new agreement made at the end of last year would help exporters to develop further trade in this prosperous and important market. Among the goods included in the list were electrical machinery, apparatus and appliances, exports of which to Cuba last year amounted to £439,000 against £273,000 in 1955.

Power from Peat

In the House of Lords Viscount Thurso asked why the cost per kW of the experimental peat-fired plant at Altnabreac had proved to be £157 as against the average for the North of Scotland Hydro-Electric Board of £56 per kW, and why the cost of generation per kWh was 2·0d to 2·3d as against the average for the North of Scotland Hydro-Electric Board of 0·64d.

Lord Strathclyde, Minister of State, Scottish Office, said the Scottish Peat Committee, in their report published in 1954, gave the estimated capital cost for a peat-fired gas turbine project at Altnabreac in March, 1953, as £368,000, with an estimated generation cost of 1·9d/kWh. The revised estimated cost to date was about £430,000, the increase being due mainly to rises in prices of materials and wages and, to a lesser extent, to the incorporation of improvements in the gas turbine. A more accurate estimate would be possible when the gas turbine came into operation, as expected, at the end of this year.

The average cost per kW of hydro-electric installations for the North of Scotland Hydro-Electric Board was not £56, but £175. The Hydro Board's average production costs per kWh in 1956 were 0·64d for hydro-electric stations, 0·93d for steam and 1·89d for diesel. It was estimated that the cost of production at a small diesel station built at to-day's prices would be over 2d per kWh.

Engineering Strike Ends

Employers and trade unions in the engineering industry failed to reach agreement upon the claim for higher wages last Friday and the Minister of Labour announced his intention to set up a court of inquiry to examine the contentions of the two parties. As on the previous occasion, the court is identical to that appointed in connection with the parallel dispute in the shipbuilding industry. The members are Professor D. T. Jack, Professor of Economics in Durham University (chairman), Brigadier L. C. Mandleberg, past-chairman of the National Employers' Association of Rayon Yarn Producers, and Mr. C. J. Geddes, a former general secretary of the Union of Post Office Workers.

The employers had made an offer representing an increase of between 3 and 4 per cent. The unions, although claiming a 10 per cent increase, had intimated that 7½ per cent would be considered reasonable. (Shipbuilding employers had made an offer of 5 per cent.)

The Minister of Labour appealed for a resumption of work while the courts of inquiry were making their investigations. The courts held their first sitting on Wednesday afternoon.

At a meeting on Tuesday last the Confederation of Shipbuilding and Engineering Unions decided to instruct their members in both industries to return to work on Thursday. Mr. H. Brotherton, president of the Confederation, said that a meeting of executive committees of unions affiliated to the Confederation would be reconvened directly the recommendations of the courts of inquiry were made known. He said that the voting for the resolution to call off the strikes was 710,177 with 449,162 against.

An amendment in favour of continuing the strike, moved by Mr. Ted Hill (Boilermakers) and seconded by Mr. F. Foulkes (Electrical Trades Union), was rejected.

Amendments to Electricity Bill

DURING the committee stage of the Electricity Bill Conservative members endeavoured to secure amendments of the provisions relating to the manufacture of plant by the proposed Central Electricity Generating Board; notice of entry upon private property for survey purposes by the Electricity Boards; and the raising of capital by the Boards.

Last week at a meeting at the House of Commons attended by about a hundred Conservative members, Lord Mills, Minister of Power, and Mr. R. Maudling, Paymaster General, heard representations on these points.

It was subsequently announced that amendments would be put down by the Government on the report stage this week meeting some of the objections. One amendment limits the power of the Generating Board to the manufacture of "anything required by the Generating Board or by an Area Board for purposes of research or development or for the repair or maintenance of their equipment." Another amendment extends the 24 hours' notice specified in the original draft to be given by a Board before entering upon private land for survey purposes to 28 days.

Amendments were tabled by Lord Hinchingbrooke to secure the elimination of the Treasury guarantee to Electricity Board loans and providing for the Boards to raise capital in the open market.

American Thermo-Nuclear Research

Research into the possibility of harnessing thermo-nuclear power is said to be making encouraging progress in the United States. This week Admiral Strauss, chairman of the Atomic Energy Commission, said that plans had been approved for the construction, at a cost of several million dollars, of a "stellarator" at Princeton University. The purpose would be to explore possible means of producing and controlling the very high temperatures needed to initiate thermo-nuclear reaction.

E.P.E.A. SALARIES DISPUTE

About six weeks has elapsed since it was announced that the Electrical Power Engineers' Association's claim for improved salaries for its members employed in the electricity supply industry was to go to arbitration. It will be recalled that on this decision the E.P.E.A. suspended its "work to rule" instructions to members.

At the time of going to press an announcement regarding the composition of the arbitration board is still awaited from the Ministry of Power. We learn, however, that it is probable that the arbitrators will be a trade union leader and a professor of electrical engineering, nominated by the Association, and a prominent man in the steel industry and a director of power companies, put forward by the electricity supply authorities.

LIGHTING and ARCHITECTURE

Integration at New Austin Sales Centre

The exhibition hall in the Austin Motor Co.'s sales centre at Longbridge, Birmingham

A COMPREHENSIVE lighting system which forms an integral part of the architecture of the Austin Motor Co.'s new premises at Longbridge, Birmingham, has resulted from close collaboration between the architect, Mr. H. W. Weedon, F.R.I.B.A., the Austin Motor Company's engineers, and G.E.C. lighting engineers, since the building was at the "drawing board" stage. The new building is the main sales centre of the British Motor Corporation, and represents an important part of a £25 million commercial expansion programme of the company which is now nearing completion.

The principal feature of the new building is a hall 180ft long by 100ft wide which serves a dual purpose: first to display all the products of the B.M.C. factories for home and overseas trade buyers and secondly as a centre for large-scale B.M.C. social functions. Adjacent to the hall are the visitors', directors' and staff dining rooms, entrance foyer and reception area, kitchens, buffet service, and a main sales office with directors' offices adjoining.

The exhibition hall is divided into a main centre bay 60ft wide, and two side aisles each 20ft wide, by a series of columns down its length. Above the columns runs a false beam carrying ventilation grilles, loudspeaker outlets, and auxiliary services; power sockets and microphone pick-up points are concealed in the bases of the columns. A false ceiling is provided at beam level over the entire area and the lighting system has been built into this. Along one side of the hall a 60ft buffet bar and service counter is illuminated by circular recessed fittings. The only natural lighting in the hall comes from tall windows on one side. These are heavily curtained and the vehicles are exhibited by artificial lighting only.

The main illumination in the hall is from three corrugated vinyl plastic diffusing panels, built into the centre bay to form a feature 27ft wide. The centre panel is 60ft long and the two outer ones are each 35ft long and they are illuminated by 234 "Osram" 5ft 80 W daylight tubes. Indirect cornices, running the whole length of the hall in four rows, are each illuminated by two rows of overlapped tubes, the outer row of de-luxe warm white, the inner of warm white. The tubes are switched in rows to enable the appearance of the ceiling, the apparent colour, and the resultant intensity, to be changed at will.

Special semi-recessed fittings are installed in the visitors' dining room, which can be used as a cinema

The side aisles are lit indirectly by a series of 10ft square recessed ceiling panels, each equipped with eight 5ft 80 W de-luxe warm white tubes mounted in prefabricated plaster cornices. When the hall is being used for social functions the indirect lighting in the side aisles can be switched separately to give light where it is needed. In addition to the daylight tubes, the centre panel contains groups of red, yellow and blue coloured tubes which are operated through two electronic dimmers, coupled together. These coloured tubes can be either on an automatic colour change which covers the panel as a whole, or can be operated as two separate halves on the same time cycle, but out of step with regard to colour. Alternatively, the coloured tubes can be controlled normally through the dimmers, to give a variety of effects or colours.

All the lighting effects are controlled from panels in the public address room which is situated above the entrance to the hall. The switches operate through contactors in the adjacent equipment room, and when the panel has been set to give the required effect a further switch connects a control in the commissionaire's room, which merely switches the whole hall "on" or "off." Indicator lights give visual signals of what is happening. A further remote control has been installed in the commissionaire's office to enable him to switch on either automatic colour change or a given pre-set colour. The electronic dimmers associated with the coloured lighting control are housed in the near-by equipment room with the remote contactors, main fuse boards, and radio equipment.

The whole of the associated control gear for the fluorescent tubes in the cornices and ceiling has been placed in the ceiling void, in which four cat-walks running the length of the building have been constructed. The control gear is bolted on to 4in by 4in cable trunking running alongside the cat-walks. The main wiring is inside the trunking, and the lighting wiring is accommodated in small section cross trunking which runs from the main trunking to the lighting positions.

Appropriate lighting has been installed in the other apartments. The general sales office, which is about 279ft long by 120ft wide, is lit by 225 two-light "Perspex" trough reflectors housing 80 W fluorescent tubes. These reflectors are attached to 2,511ft of G.E.C. lighting trunking mounted in nine rows at a height of 12ft 6in and spaced about 13ft apart. It is crossed by cable trunking which is specially filleted to contain both the main feed wiring and the telephone feeder wire.

A complete and separate emergency lighting system is installed throughout the entire building. In addition to this emergency use, this system has two alternative supplies to enable the points to have further use as a pilot lighting system, controlled from all the exit doors. "Osram" lamps and tubes are used throughout the installation which was carried out by Walker Bros., Ltd., Birmingham.

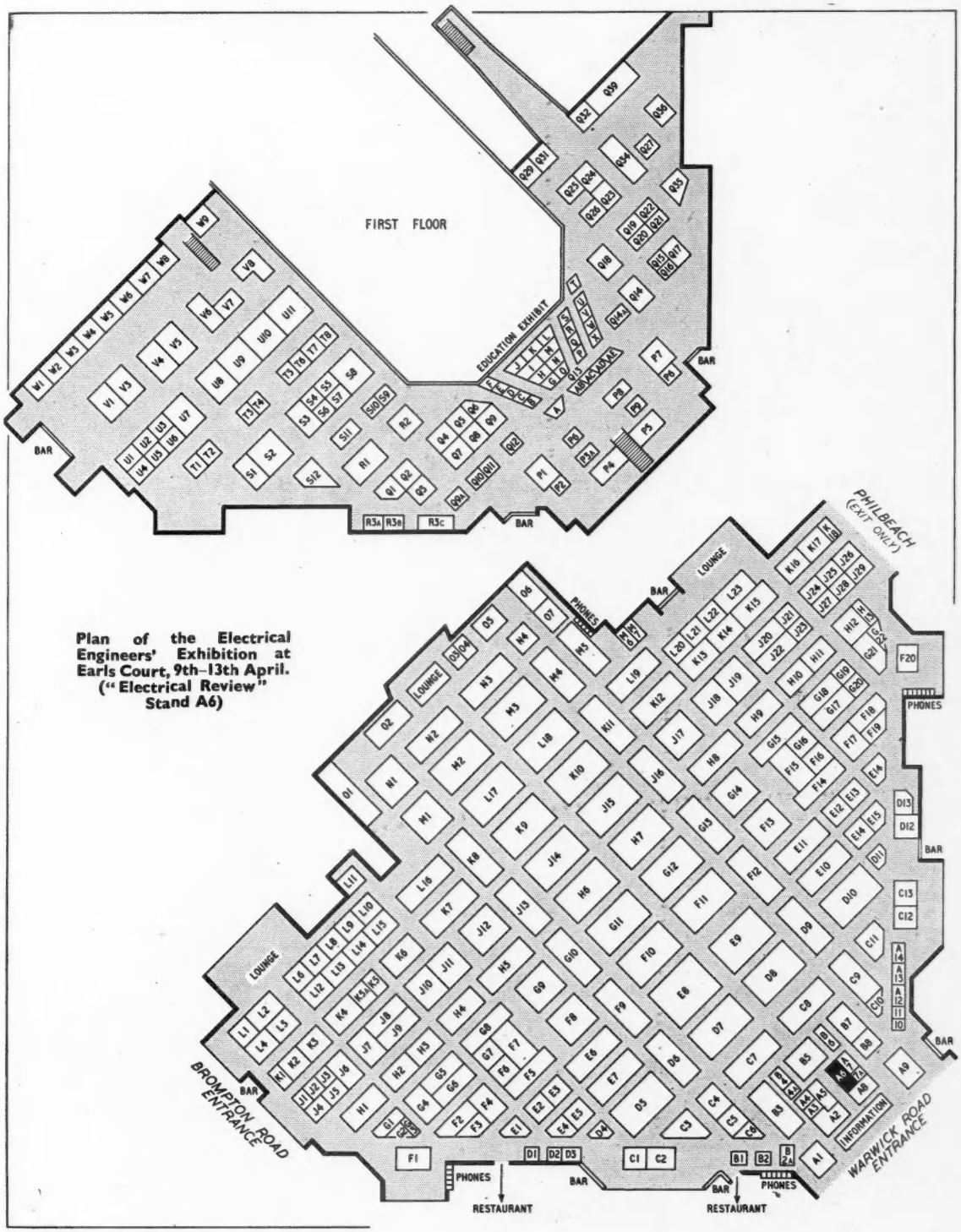
Electrical Engineers' Exhibition

LARGEST EVER DISPLAY AT EARLS COURT

Many new electrical products, both domestic and industrial, will be shown for the first time at the sixth Electrical Engineers' Exhibition to be held at Earls Court, London, from Tuesday to Saturday, 9th to 13th April. A record number of over 380 manufacturers, associations and other organisations are participating in this exhibition, an event which is now clearly regarded as the most important trade show of the electrical engineering year. The display, which will occupy a ground and first floor area of 330,000 sq ft, is now claimed to be the largest electrical exhibition to be housed under one roof in the United Kingdom. While the exhibits to be seen will cover a very wide field, ranging from generation and distribution equipment to the actual installation materials, wires and cables, lighting fittings, instruments, and other industrial and domestic equipment, attention is particularly drawn to a large educational feature, covering 7,000 sq ft. This will be supported by many of the leading companies in the industry as well as by educational authorities, H.M. Forces, and Government services, and it will be the first time that such a scheme, with the aim of attracting young people into the industry, has been attempted. Models of the three atomic power stations to be built in Scotland, Essex and Gloucestershire will be on view and another item of interest is a 4,750 W mercury vapour lamp which weighs 60 lb and is 50in in length. It will be suspended at a height of 100ft and will provide an overall light for the exhibition. As in previous years, awards will be made to manufacturers producing the most outstanding industrial and domestic exhibits. The exhibition is being officially opened at noon on Tuesday next by Lord Hailsham, Minister of Education. On the subsequent days the exhibition will be open, to the trade only, daily from 10 a.m. to 7 p.m. except Wednesday, 9 p.m.

Exhibitor	Stand No.
A.E.I. Lamp & Lighting Co., Ltd.	G12
Ac-Delco Division of General Motors, Ltd.	J11
A.C. Industries	W2
Aerialite, Ltd.	E6
Aero Research, Ltd.	Q4
Agro Electrical Co., Ltd.	C10
Aircraft-Marine Products (Gt. Britain), Ltd.	S2
Albright (Engineers), Ltd.	S7
Allen West & Co., Ltd.	M3
Alorite, Ltd.	F9
Anglo-American Vulcanised Fibre Co., Ltd.	W3
Arrow Electric Switches, Ltd.	O2
ASEA Electric, Ltd.	F13
Ashcroft Tools, Ltd.	T2
Ashdowns, Ltd.	U1
Ashley Accessories, Ltd.	K6
Association of Supervising Electrical Engineers	B5
Astral Equipment, Ltd.	E16
Astral Switchgear, Ltd.	K6
Austinlite, Ltd.	Q19
Automat	P3A
Backer Electric Co., Ltd.	J5
Bakelite, Ltd.	G21
Baldwin (H. J.) & Co., Ltd.	L13
Battery Construction, Ltd.	Q25
Bayliss, Jones & Bayliss, Ltd.	V3
Beckett & Parker, Ltd.	B2
Belmos Co., Ltd.	M2
Benjamin Electric, Ltd.	K10
Bertram Thomas (Engineers), Ltd.	D10
Besson & Robinson, Ltd.	C13
Best Products, Ltd.	V1
Bill Switchgear, Ltd.	K9
B.K.B. Electric Motors, Ltd.	K14
Blackwell (F. C.) & Co., Ltd.	G3
Bolton, Thomas & Sons, Ltd.	H12
Bourner (F. H.) & Co. (Engineers), Ltd.	S4
Bowker (S. O.), Ltd.	D3
Bowthorpe Electric Co., Ltd.	S8
Bray (Geo.) & Co., Ltd.	G22
Britannic Cables, Ltd.	Q35
British Bronson, Ltd.	S9
British Central Electrical Co., Ltd.	H9
British Electric Resistance Co., Ltd.	J29
British Electrical & Allied Industries Research Association	B7
British Electrical Development Association	B8
British Electrical Repairs, Ltd.	H5
British Insulated Callender's Cables, Ltd.	J14
British Klockner Switchgear, Ltd.	F9
British Power Transformer Co., Ltd.	J29
British Standards Institution	B6
British Switchgear Corporation, Ltd.	P2
British Thomson-Houston Co., Ltd.	G12
British Vacuum Cleaner & Engineering Co., Ltd.	U10
Britmac Electrical Co., Ltd.	C2
Brook Motors, Ltd.	L19
Brookhirst Switchgear, Ltd.	F5
Brownings Electric Co., Ltd.	C7
Brush Electrical Engineering Co., Ltd.	L17
Bryce Electric Construction Co., Ltd.	M4
Bulpitt & Sons, Ltd.	K14
Burgess Products Co., Ltd.	J26
Cable Covers, Ltd.	Q27
Cable Makers' Association	F20
Cary (William E.), Ltd.	G20
Castings—Central Engineering Works (Hastings), Ltd.	J23
Cayson Electric, Ltd.	D13
Central Electricity Authority	B3
Chance-Londex, Ltd.	Q19
Chilton Electric Products, Ltd.	C9
Chloride Batteries, Ltd.	C1
Clang, Ltd.	F1
Clare Instrument Co.	G2
Clarke (H.) & Co. (Manchester), Ltd.	Q7
Cole (E. K.), Ltd.	E14
Collet's Holdings	Q14A
Collinson's Precision Screw Co., Ltd.	T1
Comoy (H.) & Co., Ltd.	U2
Connollys (Blackley), Ltd.	P1
Contactum, Ltd.	J25
Copper Development Association	Q3
Coupleflex, Ltd.	Q10
Courtney Pope (Electrical), Ltd.	D7
Crabtree (J. A.) & Co., Ltd.	H10
Cressall Manufacturing Co., Ltd.	Q11
Critchley Bros., Ltd.	Q11
Crompton Parkinson, Ltd.	C8
Crossland (R. & A. G.), Ltd.	K5A
Crypton Equipment, Ltd.	E9
Dale Electric (Yorkshire), Ltd.	T6
Davey (W. C.) & Co.	Q32
Davis Sheet Metal Engineering Co., Ltd.	E4
De la Rue (Thomas) & Co., Ltd.	P8
Delta Technical Services, Ltd.	J2
Dennis (G. P.), Ltd.	J7
Dex Industries, Ltd.	Q12
Dexion, Ltd.	J22
" Diamond H " Switches, Ltd.	C11
Dimplex, Ltd.	A13
Donovan Electrical Co., Ltd.	F17
Donvin Instruments, Ltd.	J1
Dorman & Smith, Ltd.	F9
Dowty Group, Ltd.	J28
D.P. Battery Co., Ltd.	O4
D.S. Plugs, Ltd.	F9
Dubilier Condenser Co. (1925), Ltd.	L7
Edison Swan Electric Co., Ltd.	G11
E.F. Electric, Ltd.	J27
Ega Electric, Ltd.	Q21
Ekco-Ensign Electric, Ltd.	F8
Elco Plastics, Ltd.	R1
Electric & Ordnance Accessories Co., Ltd.	W6
Electric Construction Co., Ltd.	F12
Electrical Apparatus Co., Ltd.	J8
Electrical Association for Women	A11
Electrical Contractors' Association	Q13J
Electrical Industries Benevolent Association	B4
Electrical Remote Control Co., Ltd.	T4
Electrical Review Publications, Ltd.	A6
Electro Dynamic Construction Co., Ltd.	Q25
Electro Mechanical Manufacturing, Ltd.	A9
Electro Methods, Ltd.	S'0
Elliott Brothers (London), Ltd.	H1
Ellison (George), Ltd.	J16
E.M.B. Co., Ltd.	S1
EMP Electric, Ltd.	Q26
E.M.S. Electrical Products, Ltd.	G7
Enfield Cables, Ltd.	L'5
Engel & Gibbs, Ltd.	F6
Engineering & Lighting Equipment Co., Ltd.	Q23
English Clock Systems, Ltd.	G14
English Electric Co., Ltd.	E8
Erma, Ltd.	U6
Erskine, Heap & Co., Ltd.	E11
Everett, Edgcumbe & Co., Ltd.	M2
Evershed & Vignoles, Ltd	K4
Expanded Metal Co., Ltd.	U11
Falk, Stadelmann & Co., Ltd.	H6
Fenton, Byrn & Co., Ltd.	J19
Ferguson Pailin, Ltd.	G8
Ferranti, Ltd.	L18
Fibreglass, Ltd.	U4
Fitzgibbon & Murray, Ltd.	B1
Forrest (George) & Son, Ltd.	D9
Foster Transformers, Ltd.	E9
Fractional H.P. Motors, Ltd.	J23
Friedland (V. & E.), Ltd.	F3
Fuller Electrical & Manufacturing Co., Ltd.	F13
General Cable Manufacturing Co., Ltd.	Q35
General Electric Co., Ltd.	J15
Gent & Co., Ltd.	L6
Gilflex Conduits, Ltd.	P3
Gillott Electro Appliances, Ltd.	G5
Glover (W. T.) & Co., Ltd.	L23
Gosheron (John) & Co.	W4
Griffiths Bros. & Co., London, Ltd.	J6
Gulf Oil (Gt. Britain), Ltd.	F4
G.W.B. Furnaces, Ltd.	L9
Hackbridge & Hewittic Electric Co., Ltd.	D10
Hall (J. Edward) (Electrical Engineers), Ltd.	V6
Harris & Sheldon (Electrical), Ltd.	K7
Hawke Cable Glands, Ltd.	P6
Hawkins (L. G.) & Co., Ltd.	L20
Heatovent Electric, Ltd.	F16
Heatrae, Ltd.	J4
Heayberd (F. C.) & Co., Ltd.	V7
Hedin, Ltd.	E5
Heenan & Froude, Ltd.	Q24
Hellermann, Ltd.	S8
Henley's W.T. Telegraph Works Co., Ltd.	G15
Herman Smith (Smithlite), Ltd.	R2
Hilmor, Ltd.	R3B
Hirst Electronic Development, Ltd.	E13
Holophane, Ltd.	E1
Homeshade Co., Ltd.	R3C
Honeywell Brown, Ltd.	Q9
Hoover, Ltd.	N4
Hotpoint Electric Appliance Co., Ltd.	J12
Hunt (A. H.) (Capacitors), Ltd.	O6
H.V.E. (Electric), Ltd.	T5
Illuminating Engineering Society	Q13K
Imperial Chemical Industries, Ltd.	L10
Industrial Tapes, Ltd.	T8
Institution of Electrical Engineers	Q13O
Insulating Components & Materials, Ltd.	Q1
Insuloid Manufacturing Co., Ltd.	U3
Ioco, Ltd.	U5
Ionlite, Ltd.	H6
Irish Cables, Ltd.	W9
Isopad, Ltd.	M7
Jackson Electric Stove Co., Ltd.	W5
Jeary Electrical Co., Ltd.	J9
Johnson, Matthey & Co., Ltd.	S12
Johnson (Richard) & Nephew, Ltd.	K12
Johnson & Phillips, Ltd.	K8
Jones & Stevens, Ltd.	Q15
Joyce Electrical Co., Ltd.	P9
Kent Bros. ElectricWire Co. & E. H. Phillips, Ltd.	F14
Kersons Manufacturing Co., Ltd.	D8
Key Engineering Co., Ltd.	P4
Kilpatrick (James) & Sons, Ltd.	M6
Klaxon, Ltd.	L1

Exhibitor	Stand No.
Lancashire Dynamo Group	E9
Langley London, Ltd.	A1
Laurence Scott & Electromotors, Ltd.	M5
Lewden Metal Products, Ltd.	F19
Light and Power Accessories Co., Ltd.	Q5
Line Equipment, Ltd.	S8
Liverpool Electric Cable Co., Ltd.	L2
Loblite, Ltd.	T7
Londex, Ltd.	C4
London Electric Wire Co. and Smiths, Ltd.	L2
London Transformer Products, Ltd.	K15
Long & Crawford, Ltd.	U9
Lord's Controls, Ltd.	W2
Lyon (Arthur) & Co. (Engineers), Ltd.	L4
Maclaren (Robert) & Co., Ltd.	F18
McGeoch (William) & Co., Ltd.	M1
Magneta Time Co., Ltd.	U10
Major Equipment Co., Ltd.	C3
Mallory Metallurgical Products, Ltd.	S12
Mantel Metalworkers, Ltd.	L12
Marbourn, Ltd.	V8
Marryat & Place, Ltd.	J21
Martindale Electric Co., Ltd.	E12
M. & C. Switchgear, Ltd.	G18
M.C.B. Co. (Manchester), Ltd.	D2
Measuring Instruments (Pullin), Ltd.	J1



Plan of the Electrical Engineers' Exhibition at Earls Court, 9th–13th April. ("Electrical Review" Stand A6)

Exhibitor	Stand No.
Merlin Mouldings, Ltd.	W8
Mersey Cable Works, Ltd.	F11
Metropolitan-Vickers Electrical Co., Ltd.	H8
Metway Electrical Industries, Ltd.	K13
Micanite & Insulators Co., Ltd.	U7
Midland Coil Winding Co., Ltd.	K7
Midland Electric Manufacturing Co., Ltd.	D8
Midland Silicones, Ltd.	C12
Miller-Kent Decoratives, Ltd.	W7
M.K. Electric, Ltd.	N2
Monsanto Chemicals, Ltd.	V4
Morphy-Richards, Ltd.	E16
M.T.E. Control Gear, Ltd.	L21
Mycalex and T.I.M., Ltd.	T2
Nalder Bros. & Thompson, Ltd.	N3
National Inspection Council	B4A
Nelson Engineering Co., Ltd.	C13
Nettle Accessories, Ltd.	E6
New Day Electrical Accessories, Ltd.	G5
Newman Industries, Ltd.	H2
Nife Batteries, Ltd.	L22
Oldham & Son, Ltd.	K16
Oliver Pell Control, Ltd.	C13
Otter Controls, Ltd.	Q22
Ottermill Switchgear, Ltd.	H3
Panelec (Gt. Britain), Ltd.	S11
Parmiter, Hope & Sugden, Ltd.	E10
Parnall (Yate), Ltd.	V5
Partridge, Wilson & Co., Ltd.	L5
P. & B. Engineering Co., Ltd.	R3A
Permali, Ltd.	O1
Philips Electrical, Ltd.	F10
Philplug Products, Ltd.	T3
Pinnes Electrical Products, Ltd.	K18
Pirelli-General Cable Works, Ltd.	Q2
Poles, Ltd.	P7
Porter Electrical Products, Ltd.	D1
Power Centre Co., Ltd.	L16
Power Connectors, Ltd.	H13
Process Control Gear, Ltd.	K1
Pyrotenax, Ltd.	O5
Railway & General Engineering Co., Ltd.	L13
Ranton & Co., Ltd.	C5
Rawlplug Co., Ltd.	G4
Reason Manufacturing Co., Ltd.	M3
Record Electrical Co., Ltd.	G16
Remploy, Ltd.	Q31
Resinoid & Mica Products, Ltd.	G5
Revo Electric Co., Ltd.	G6
Reyrolle (A.) & Co., Ltd.	J10
Rheostatic Co., Ltd.	G9
Ross, Courtney & Co., Ltd.	G5
Rotaflex (Gt. Britain), Ltd.	Q20
Roura & Forgas, Ltd.	S5
Rowlands Electrical Accessories, Ltd.	J17
Runbaken Electrical Products	S6
Sanders (W. H.) Electronics	Q9A
Sanders (Wm.) & Co. (Wednesbury), Ltd.	E2
Sangamo Weston, Ltd.	N1
Sankey (Joseph) & Sons, Ltd.	F7
Santon, Ltd.	E3
Scholes (George H.) & Co., Ltd.	E7
Scottish Cables, Ltd.	J24
Sealed Motor Construction Co., Ltd.	Q25
Siemens Bros & Co., Ltd.	G11
Siemens-Schuckert (Gt. Britain), Ltd.	M4
Simplex Electric Co., Ltd.	F11
Sims (R. F.) (Electronics), Ltd.	R1
Slough Metals, Ltd.	A10
S.L.R. Electric, Ltd.	Q6
Small Electric Motors, Ltd.	L8
Smith (Frederick) & Co., Ltd.	L2
Smith Hobson, Ltd.	Q16
Smith Meters, Ltd.	W1
Smiths Clocks & Watches, Ltd.	G14
Smiths Industrial Instruments, Ltd.	Q17
South Wales Switchgear, Ltd.	J18
Square D, Ltd.	U8
Standard Telephones & Cables, Ltd.	H7
Statter (J. G.) & Co., Ltd.	J20 & E9
Sterdy Telephones, Ltd.	Q32
Sterling Cable Co., Ltd.	Q18
Stone-Chance, Ltd.	Q19
Stream-Line Filters	Q34
Sunvic Controls, Ltd.	D6
Sumo Pumps, Ltd.	Q19
Switchgear & Cowans, Ltd.	Q39
Symons (H. D) & Co., Ltd.	K17
Synchronome Co., Ltd.	L14
Synthetic Carbon & Engineering Co., Ltd.	D4
Tate Bros., Ltd.	Q29
Taylor (George E.) & Co. (London), Ltd.	O3
Taylor, Tunnicliff & Co., Ltd.	W6
Telegraph Construction & Maintenance Co., Ltd.	G10
Tetra Engineering Co., Ltd.	G19
Thermat, Ltd.	L13
Thermodare (Great Britain)	G1
Thorn Electrical Industries, Ltd.	D9
Thorpe (F. W.), Ltd.	F2
T.M.C.-Harwell (Sales), Ltd.	K5
Tricity Cookers, Ltd.	D9
Troughton & Young, Ltd.	H4
Tube Lamination & Engineering, Ltd.	R1
Tucker (J. H.) & Co., Ltd.	D8
Tudor Accumulator Co., Ltd.	J3
Tufnol, Ltd.	K11
Turners Asbestos Cement Co., Ltd.	K2
Tyrad Electric, Ltd.	H4
Uni-Tubes, Ltd.	A12
Vactite Wire Co., Ltd.	L2
Varilectric, Ltd.	H11
Veritys, Ltd.	Q8
Victor Products (Wallsend), Ltd.	P5
Volex Electrical Products, Ltd.	F15
Walker (W. G.) & Co. (Engineers), Ltd.	G20
Wallacetown Engineering Co., Ltd.	Q14
Walsall Conduits, Ltd.	G13
Wandleside Cable Works, Ltd.	W9
Wandsworth Electrical Manufacturing Co., Ltd.	C6
Watford Electric & Manufacturing Co., Ltd.	G17
Watliff Co., Ltd.	L11
Weir Electrical Instrument Co., Ltd.	D11
Westinghouse Brake and Signal Co., Ltd.	J13
Westwood Switchgear, Ltd.	C3
Whipp & Bourne, Ltd.	K3
Wiggin (Henry) & Co., Ltd.	E15
Wilcox (Edward) & Co., Ltd.	S3
William White (Switchgear), Ltd.	D12
Wireohms, Ltd.	L13
Woden Transformer Co., Ltd.	O7
Yorkshire Copper Works, Ltd.	D5
Yorkshire Switchgear & Engineering Co., Ltd.	A9

ILLUSTRATED STAND-BY-STAND PREVIEW

A.E.I. Lamp & Lighting Co., Ltd., Crown House, Aldwych, London, W.C.2. —**Stand G.12.**—Applications of universal trunking, "Invertrunking" and shallow trunking are demonstrated in conjunction with a range of fluorescent fittings. Industrial lighting fittings of special interest include fluorescent and tungsten flameproof fittings, blended light units and various floodlights. A new range of shop and display lighting fittings is also shown, together with the new "Satina" commercial fittings with British made satin-etched glass.

AC-Delco Division of General Motors, Ltd., Dunstable, Beds.—**Stand J.11.**—Exhibits cover a wide range of f.h.p. motors of various sizes and types including capacitor start and split phase types, rotor/stator units, universal motors and l.v. d.c. motors.

Aerialite, Ltd., Castle Works, Stalybridge, Cheshire.—**Stand E.6.**—Among cables exhibited are the "Ashton" and "Ashathene" power and lighting cables, armoured thermoplastic cables and miscellaneous special purpose cables. Of particular interest in the plastic insulated range are the polythene and p.v.c. insulated cables for voltages up to 660 V. Floor heating cables (developed in conjunction with Electra (Birmingham 1935), Ltd., London, W.1) are shown for the first time by the company and another new range is that of mine trailing cables. Specimens of Type 30 and Type 36 drill cable are shown. A special feature of the display is a multipoint network which shows the "Aeraxial" cable runs and the entire distribution system.

Aero Research, Ltd., Duxford, Cambridge.—**Stand Q.4.**—"Araldite" epoxy resins, widely used in the electrical industry as casting, potting, impregnating, sealing and laminating materials, are displayed. Of particular interest for the heavy electrical industry are gravity casting resins (for solid and structural insulation), cold and hot cured resins for glasscloth laminates, coatings and adhesives.

Agro Electrical Co., Ltd., 60–66, Wardour Street, London, W.1.—**Stand C.10.**—A full range of wiring accessories includes lampholders, ceiling roses and associated accessories. There is also a range of metalclad weatherproof bells and pushes, suitable for fire alarm systems, etc., together with Bakelite bells, buzzers, pushes and transformers. Among new products is a selection of bell transformers.

Aircraft Marine Products (Great Britain), Ltd., Scottish Industrial Estates, Port Glasgow, Scotland.—**Stand S.2.**—"AMP" solderless wiring devices exhibited include pre-insulated terminals, terminals for solid wire, special pins, plugs, disconnects, quick disconnects, etc. Of particular interest are special connections and terminations for printed circuit work.

Albright (Engineers), Ltd., 125, Red Lion Road, Tolworth, Surbiton, Surrey.—**Stand S.7.**—Besides solenoid switches and relays for industrial use, heavy duty switches and switch panels, tap changing switches for arc welders, etc., and selector switches, the exhibits include commutators and sliprings from 1½in diameter upwards and special slipring assemblies and brushgear for helicopters and centrifuges.

Allen West & Co., Ltd., Brighton, 7.—**Stand M.3.**—Motor starters and control equipment in a wide range of designs for both standard industrial and flameproof installations. Representative of the range of oil-break, vertically isolated switchgear manufactured by the company are examples for 400 V, 3·3 kV and 11 kV, at ratings up to 250 MVA A.S.T.A. proved breaking and making capacity.

Anglo-American Vulcanized Fibre Co., Ltd., Cayton Works, Bath Street, London, E.C.1.—**Stand W.3.**—In addition to a full range of "Delanco" insulating materials for the electrical industry there is a special section devoted to mica and mica stampings.

Arrow Electric Switches, Ltd., Hanger Lane, Ealing, London, W.5.—**Stand O.2.**—The "Arrostarter" range of direct-on-line starters with variable overload protection are shown for the first time. They range from ¼ to 5 h.p. at 440 V 50 c/s 3-phase. Magnetic contactors with the exclusive "Arrow" right-angle mechanism are available in 30, 50 and 100 A sizes, both enclosed and unenclosed. A new addition is a smaller direct-acting contactor having a non-inductive rating of 15 A per pole. Push-button stations, direct-on-line starters up to 10 h.p. and star/delta types up to 12 h.p. are also on view, together with control panels. The range of rotary and tumbler switches has been further extended

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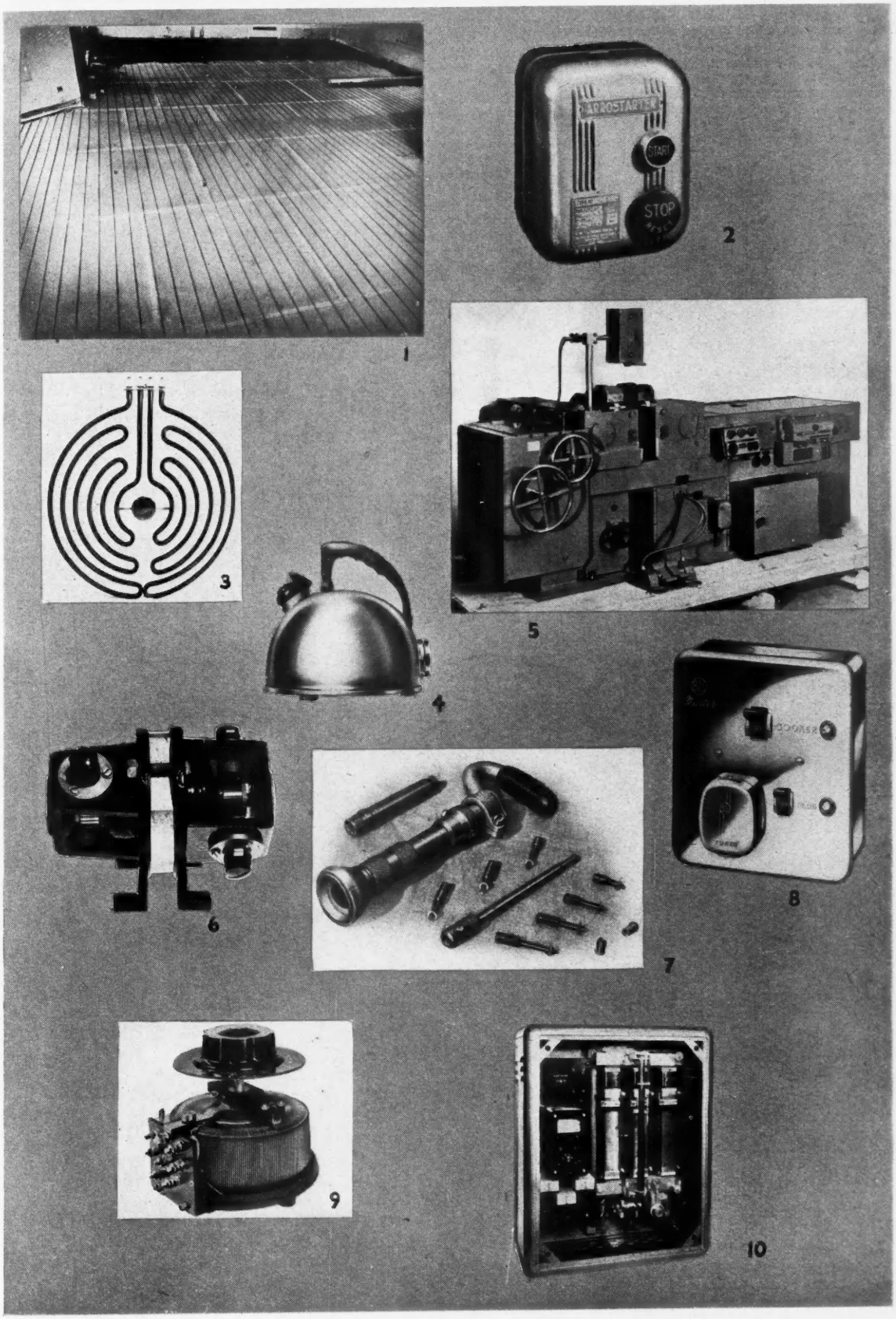
See opposite page : 1. *Typical floor heating installation using "Aerialite" cable (developed in conjunction with Electra (Birmingham 1935), Ltd.).* **2.** *Arrow Electric Switches "Arrostarter" direct-on-line starter.* **3.** *Backer Electric 5 kW air-duct heating element.* **4.** *Best Products "Herald" electric kettle.* **5.** *Asea Electric automatic flash welder.* **6.** *B.K.B. Class "F" rotary transformer.* **7.** *F. H. Bourner "Supadynamic" cartridge operated tool.* **8.** *Bill Switchgear "Master" cooker switch with twin pilot lights.* **9.** *British Electric Resistance Co.'s rotary "Regavolt" variable transformer.* **10.** *British Power Transformer Co.'s model A-13GW automatic voltage regulator*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by the addition of a number of new types suitable for small motor control.

Asea Electric, Ltd., Fulbourne Road, Walthamstow, London, E.17.—**Stand F.13.**—The "Asdet" electronic metal detector uses a single coil as a search head as opposed to the conventional twin (balanced) coil system. It employs three valves only, has a large sensitivity range and is fitted with an adjustable time delay relay with two normally made and two normally open contacts for signalling purposes. The company's electric hoists range from 2½ cwt to 5 tons and a typical unit of 1 ton capacity is being exhibited. A totally enclosed trolley wire or busbar system for use with cranes and hoists can also be seen. The type of capacitor for p.f. correction chosen for display is the sealed unit indirect foil cooled pattern which is claimed to give considerable space saving over conventional tank types.

Shunt type infinitely variable speed commutator motors and control gear are being demonstrated and also on view is an automatic flash welder for tube systems up to 5½in o.d. with patent automatic flash and upset reduction device; an extra heavy duty lightning arrestor suitable for use on a 275 kV solidly earthed neutral system; a stack of four capacitors each rated at 1·33 kV, 27 kVAr, 50 c/s; a capacitor tripping device which permits the use of circuit-breaker shunt trip coils in those stations where no independent supply is available; and a selection of relays.

Ashcroft Tools, Ltd., Ashcroft Road, Cirencester, Glos.—**Stand T.2.**—The new "Win-o-Sum" fan heater and air circulator for domestic use is shown for the first time.

Ashdowns, Ltd., Eccleston Works, St. Helens, Lancs.—**Stand V.1.**—As manufacturers of industrial plastics this company is exhibiting a wide range of "Ashlam" synthetic resin bonded paper, fabric and glass fabric laminates, and a selection of fabricated components and thermoplastic lighting troughs. "Ashlam" laminates are produced in a number of grades designed to meet all the appropriate British Standard, Government and trade specifications.

Ashley Accessories, Ltd., Ulverston, Lancs.—**Stand K.6.**—Accessories for lighting and power installations include a special display of 13 A ring circuit accessories, with shuttered sockets and switch-socket outlets and fused plugs for plaster depth flush or B.S. 1299 box, and surface mounting. Lampholders in heat resisting material, for use in abnormal conditions, are new developments.

Astral Switchgear, Ltd., Alma Road, Enfield, Middlesex.—**Stand K.6.**—The wide range of equipment shown includes K.E.M.A. tested fuse switchgear of unit and flush types in 60, 160 and 300 A ratings; switchboards, control and instrumentation panels; busbar chambers, terminal and link boxes for l.v. power and telephone cable testing; "Astral" multi-way terminal units; surface, flush and weatherproof types of adaptable boxes and switchboards, etc., built to special order.

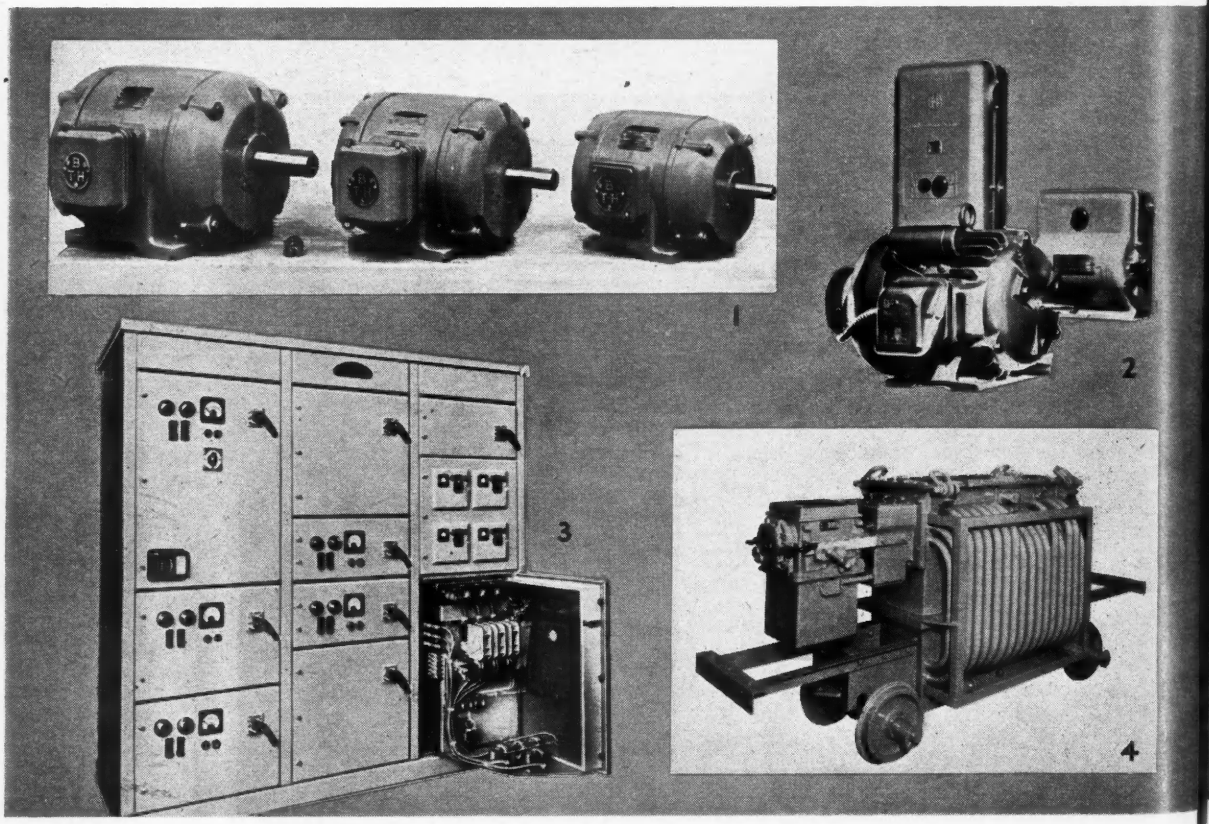
Austinlite, Ltd., Gatwick Road, Crawley, Sussex.—**Stand Q.19.**—Automatic control switchgear with examples of control cubicles, an electronic synchronising unit, precision marginal relays, and a selection of "Austinlite" 10, 15, 30 and 50 A rotary switches for multi-circuit operation are among the exhibits on this stand.

Automat, 366, Moorside Road, Swinton, Manchester.—**Stand P.3A.**—High stability selenium metal rectifiers manufactured by a carefully controlled process involving vacuum evaporation techniques.

Backer Electric Co., Ltd., Fitzwilliam Road, Rotherham, Yorks.—**Stand J.5.**—The advantages of using tubular sheathed heating elements as a compact, efficient and economical heat source for a wide variety of industrial processes are emphasised. Elements displayed include industrial immersion heaters, groove embedded platen and die heaters, roll pre-heaters, infra-red hood assemblies, turbine bolt heaters, etc. Catering equipment ranges from heavy-duty radiant hotplates, griddle, grill and deep-fat fryer elements to domestic boiling plates, oven and percolator elements.

Bakelite, Ltd., 12–18, Grosvenor Gardens, London, S.W.1.—**Stand G.21.**—Prominent among the plastics exhibited is "Bakelite Laminated" which has many applications in both light and heavy electrical equipment. Among recent developments are metal-faced laminated materials for the production of printed circuits, and "compregnated" wood for heavy industrial insulation. In addition, glass laminates based on melamine, silicone and phenolic resins, are also displayed. Resins include grades extensively used in the manufacture of electrical varnishes.

1. Three of the new B.T.H. ventilated electric motors (Type KN-C). 2. Brook Motors single-phase "Power Pack" combined motor and starter. 3. Brookhirst switchboard with swing-out panels. 4. Bryce 200 kVA mining type transformer



H. J. Baldwin & Co., Ltd., 132, Arkwright Street, Nottingham.—**Stand L.13.**—Cable protection covers, stoneware conduits and joint boxes are shown by the company's Civil and General Engineering Division, together with examples of transmission and distribution accessories, unit-construction fencing, and a range of "Wilson" patent turret-jaw bench and machine vices. This year the stand also represents the interests of the associated company, the Railway & General Engineering Co., Ltd., of Nottingham. The Electric Appliance Division is exhibiting "Wireohms" heating elements and immersion type kettle elements and "Thermat" blankets and pads.

Bayliss, Jones & Bayliss, Ltd., Victoria Works, Wolverhampton, Staffs.—**Stand V.3.**—Transmission line steelwork for h.v. and l.v. systems and telecommunications is shown, together with steel fencing and gates for power stations and substations.

Beckett & Parker, Ltd., 157–159, Summer Lane, Birmingham, 19.—**Stand B.2.**—The company's flameproof meter range has been extended by the introduction of a 6in scale instrument, and among new products is a range of flush mounting square meters with rectangular windows and a relay meter in which a pair of contacts can be closed at any current or voltage, the setting being adjusted from the front of the instrument.

Belmos Co., Ltd., Bellshill, Lanarkshire.—**Stand M.2.**—M.v. control gear for motor starting up to 200 h.p. and circuit-breakers of 200 and 600 A capacity are shown along with the company's recently introduced 100 A fuse-switch. Among switchboard exhibits is the versatile "D" range of flush fronted, multi-tier, cubicle construction types and a switchboard of the new space-saving "G" range of control gear, suitable for back-to-wall mounting, and incorporating 4- and 5-tier units along with a 5-tier 100 A fuse-switch section. The flameproof exhibit shows a switchboard arrangement suited to the oil industry.

Benjamin Electric, Ltd., Brantwood Road, Tottenham, London, N.17.—**Stand K.10.**—Four sections of the stand cover fluorescent, industrial, commercial and outdoor lighting fittings, the majority being finished in "Crysteel" vitreous enamel. An improved model of the earlier dust-proof "Flurolier" enables it to be used in corrosive conditions, etc. Other new products are open-ended "Peropal" finish "Flurolier" fittings; a ceiling "Coolicon" shade which incorporates a canopy and lampholder which fit direct to the ceiling; and the "Bentric" contemporary fitting of simple design which caters for installations where a greater output than that of the "Benflux" reflector is desired.

Best Products, Ltd., Felix Works, Felixstowe.—**Stand V.1.**—Colour is the dominating feature of this display which includes the "Best" automatic coffee percolator, the "Family" and "Fanfare" kettles and two new kettles, the "Herald" 4-pint 1,500 W anodised aluminium kettle, and the "Callboy"—fitted with a heavy-gauge flat base for use on electric hotplates. Other domestic products on view include "Best" de-luxe electric blankets and mattress overlays.

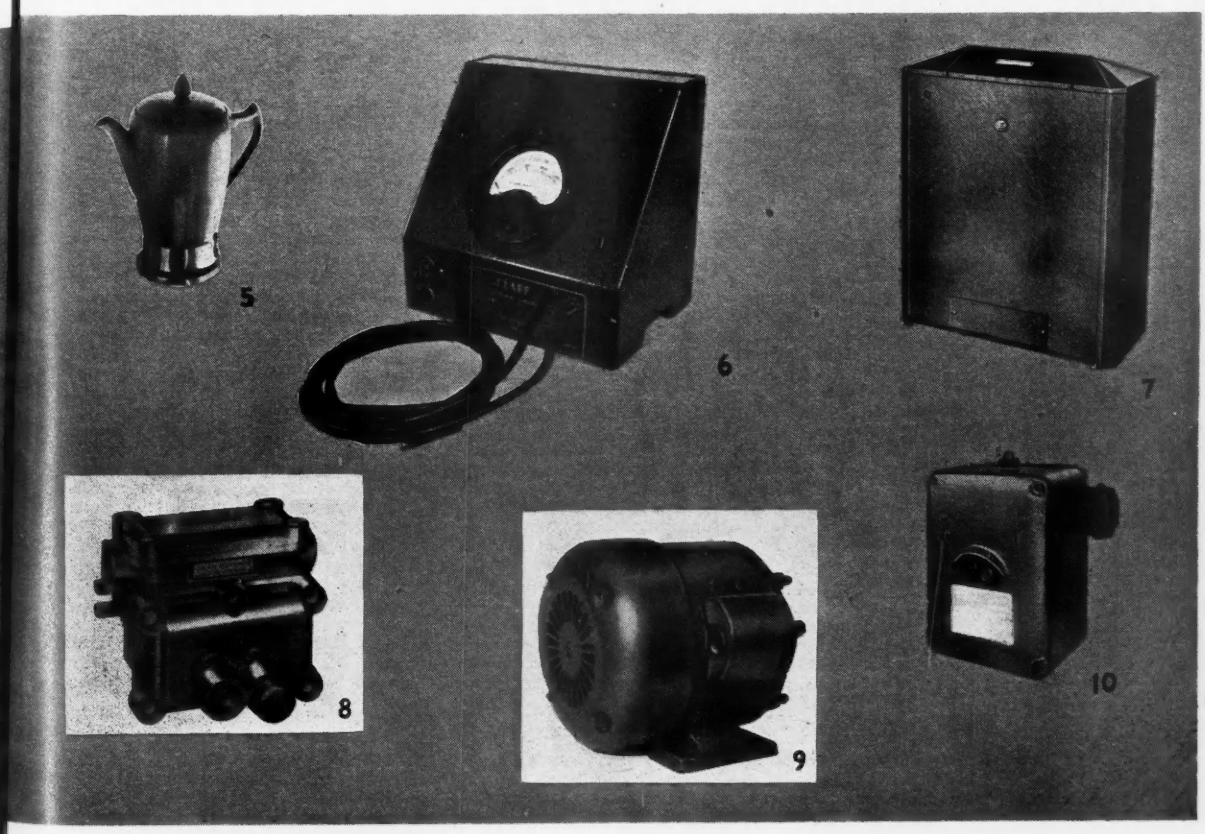
In a different category is the "Best" vacuo junction, a device for measuring small electric currents of audible and radio frequencies. Its compact size lends itself to being built into small ammeters and voltmeters, thus rendering possible direct indication of h.f. currents in standard switchboard meters.

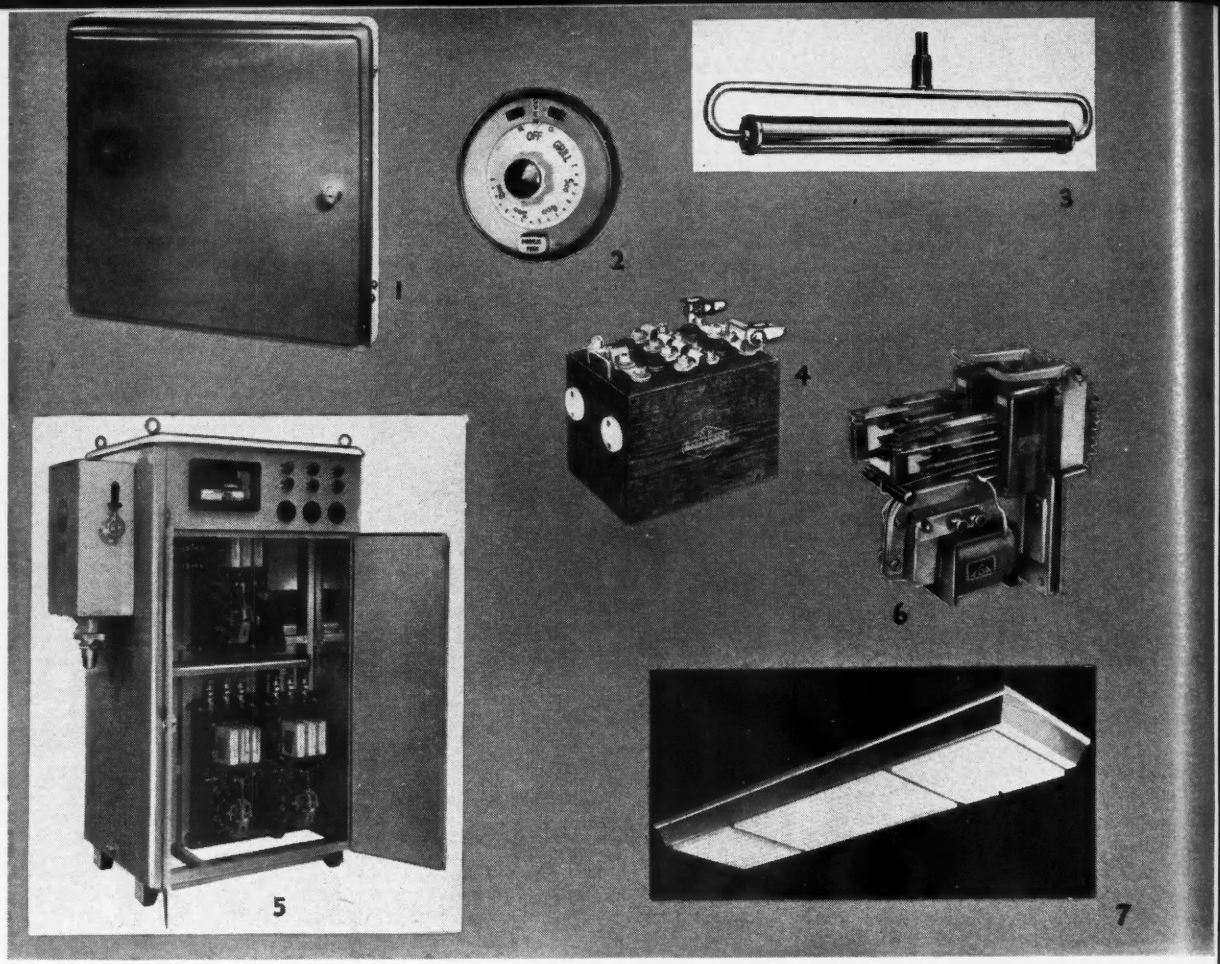
Bill Switchgear, Ltd., Aston Lane, Perry Barr, Birmingham, 20.—**Stand K.9.**—A comprehensive display of industrial and domestic electrical distribution gear comprises a "Majestic" cubicle type switchboard (developed and improved from the previously exhibited prototype); typical standard type industrial switchboard panels and busbar chambers; "Imperial" h.r.c. fuse-switch units; water heater control switches; rewirable fuseboards; "Master" cooker control switches and "Civic" consumers' control units; ironclad switchgear; "Crown" s.p. and n. a.c. switchfuses and switch splitters, all-insulated and metalclad; and a wide range of 5, 13 and 15 A switch-sockets and plugs.

New products include 30 and 60 A a.c. slow-break metalclad switches, a 13 A flush-type spur fused box, all-insulated versions of the "Civic" consumers' units and a "Master" cooker switch with single or twin pilot lights. The "Imperial" range of fuse switches has been extended to include 800 A capacity units.

B.K.B. Electric Motors, Ltd., Hibbert Street Works, Luton, Beds.—**Stand K.14.**—F.h.p. motors, small generators and rotary transformers are among the exhibits of this company whose production consists

5. Bulpitt "Belgrave" percolator. 6. Clare R.115 flash tester. 7. E. K. Cole 1½kW "Thermostor" heater. 8. Crabtree flameproof remote control station. 9. Crompton Parkinson totally-enclosed, fan-cooled three-phase f.h.p. motor. 10. Dale earth prove unit





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1. G. P. Dennis "Hi-Style" distribution fuseboard. 2. "Diamond H" Switches circular escutcheon for cooker control panels. 3. Dimplex 750 W domestic infra-red heater. 4. Typical battery from the D.P. Battery Co.'s "R" range. 5. Dubilier 201 kVAr, 415 V, p.f. correction capacitor. 6. Ega Electric small power plug-in relay inserted in its terminal base. 7. Ekco Ensign decorative ceiling fitting

mainly of making motors to customers' requirements. The latest development is a very small capacitor motor, class "T," which has been developed for use in a fan unit. A motor which operates portable traffic signals can be seen in operation.

F. C. Blackwell & Co., Ltd., Musker Street, Crosby, Liverpool, 23.—**Stand G.3.**—New flexible tube adaptors and dry partition wall switches or socket boxes are displayed, in addition to a range of conduit fittings and switch boxes in pressed steel, copper, aluminium and zinc alloy.

Thomas Bolton & Sons, Ltd., Mersey Copper Works, Widnes, Lancs.—**Stand H.12.**—Exhibits include copper and copper-base alloys in the form of wire and strand, bar and rod, sheet, strip and foil, commutator and other sections, tubes and machined parts; "Combarloy" and h.c. copper commutator segments; copper busbars; Bolton's patent cellular conductors; rotor and stator end rings; trolley and contact wire; plain wire for cables and flexibles; and strip and various sections for electrical purposes.

F. H. Bourner & Co. (Engineers), Ltd., Manor Royal, Crawley, Sussex.—**Stand S.4.**—The "Supadynamic" cartridge operated tool and the "Supadrive" hammer operated tool are demonstrated on this stand. Among the many uses to which the "Supadynamic" can be applied are fixing electrical conduit clips, cable clips, saddles, switch, fuse and junction boxes and insulating boards to steel, brick or concrete.

S. O. Bowker, Ltd., 19, Warstone Lane, Birmingham, 18.—**Stand D.3.**—Joint boxes for ring main circuits, cable fastening components, earthing clips, porcelain connectors, conduit fittings, etc., are shown in addition to a complete range of switches, socket outlets and bell pushes.

Bowthorpe Electric Co., Ltd., Tinsley Lane, Crawley, Sussex.—**Stand S.8.**—A comprehensive range of overhead line fittings for copper and aluminium lines includes line taps in aluminium and brass, insulating shrouds, transformer connectors, line connectors, operating rods, wire rope clips, mid-span tension joints in aluminium and copper, line clamps, terminating thimbles, running-out blocks, insulators, and deadend clamps. In addition there is a selection of linesmen's tools and accessories. The company's system of wood pole preservation using "Tutzal" paste and a bandage is displayed, and a new development, compression terminals, is shown for the first time.

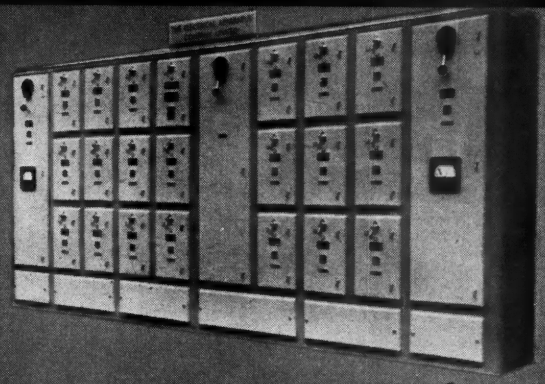
Geo. Bray & Co., Ltd., Leicester Place, Blackman Lane, Leeds, 2.—**Stand G.22.**—A representative selection of products manufactured by both the electrical and ceramic departments is shown. These include an extensive range of electric heating elements, all of the refractory-embedded, metal sheathed type, available in strip, ring, pad, cartridge and sheathed wire form, and samples of complete air heater batteries and immersion heaters. Small electro-ceramic insulators in the form of tubes, beads, bushes and washers are also shown.

British Bronson, Ltd., Stocklake, Aylesbury, Bucks.—**Stand S.9.**—Exhibits include various forms of contactor switchgear, the "Suds-Pump and Coolant" unit, and a full range of motors including the "Dynaplus" 2-speed, which is capable of withstanding up to 30 speed changes and reversals per minute.

British Electric Resistance Co., Ltd., Queensway, Enfield, Middlesex.—**Stand J.29.**—This company introduces three new additions to its range of rotary "Regavolt" variable transformers, Types 70, 71 and 72, having ratings of 1·5 and 2·5 kVA. The range now extends from 250 VA to 2·5 kVA. All these models are available as ganged or motorised units and, in addition, there are special models for 400–2,500 c/s for the requirements of the aircraft industry. A special feature of the new models is the self-aligning brush gear giving a constant contact area and sustained contact resistance.

British Electrical & Allied Industries Research Association (E.R.A.), Thorncroft Manor, Dorking Road, Leatherhead, Surrey.—**Stand B.7.**—Among items exhibited are a 200 kV surge generator; a lightning flash counter; and apparatus used in connection with research on the effect of soil characteristics on cable ratings. Work on agriculture and horticulture is covered, and other aspects of the Association's work are illustrated by photographs and films.

British Electrical Development Association, 2, Savoy Hill, London, W.C.2.—**Stand B.8.**—The numerous in-



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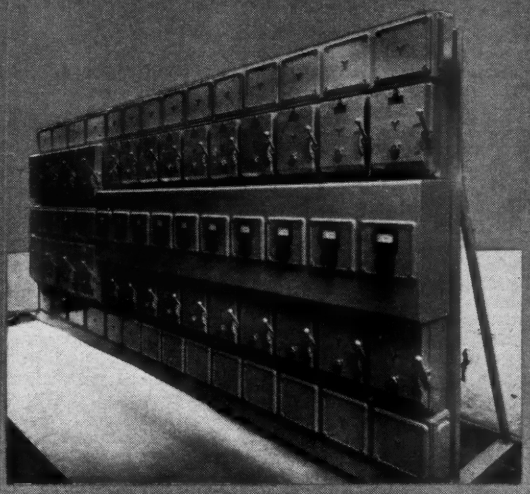

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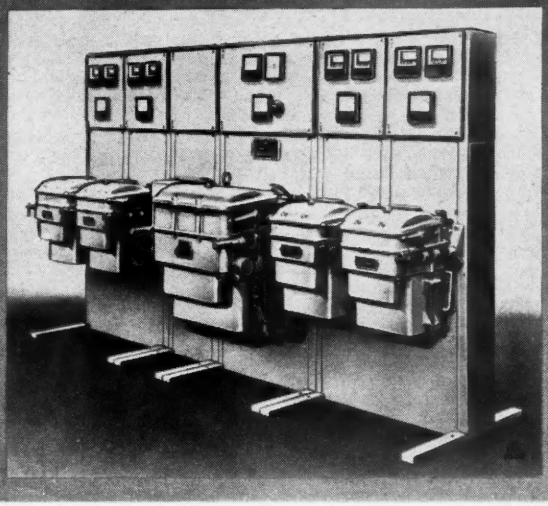

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8. *Typical E.A.C. cubicle type automatic starting panel (Electrical Apparatus Co., Ltd.).* **9.** *Duplicate busbar unit type "Y" fuse switchboard (Electro Mechanical Mfg. Co.).* **10.** *The current carrying capacities of the GEO circuit-breakers on this Ellison switchboard range from 400 to 1,200 A*

dustrial applications of electricity are emphasised on this stand. On display are industrial lighting fittings for use with fluorescent and m.v. lamps, examples of dustproof, moisture proof, flameproof and acid-resistant fittings, as well as floodlight projectors.

A selection of block storage heaters for factory and office heating can be seen in operation, and space is also given to a display of working electric fan heaters and infra-red heaters, and ventilation and extract fans for factory use.

British Electrical Repairs, Ltd., 10, Charlotte Street, Manchester, 1.—**Stand H.5.**—The electrical plant repair service operated by this company is indicated by samples of the wide range of coils manufactured with Class "A," "B" or "H" insulation. Examples of segments employed in commutators of large diameter are shown; and a typical "mica wrapped" 3·3 kV 3-phase stator winding connected for 12-pole has been fitted into a 108-slot skeleton stator for ease of inspection.

British Insulated Callender's Cables, Ltd., Norfolk House, Norfolk Street, London, W.C.2.—**Stand J.14.**—A feature of the company's display is an illuminated panel showing diagrammatically part of the main super-voltage cable network in Vancouver. This includes five 16-mile continuous lengths of 138 kV gas-filled submarine cable manufactured and installed by B.I.C.C. to link Vancouver Island with the power source on the mainland, and a 230 kV oil-filled cable system now being installed by B.I.C.C. in Vancouver itself. Equipment especially designed for Calder Hall is also on view.

Other new developments are a model of the 2-million-volt van de Graaf accelerator and two new cables for marine use, a butyl rubber insulated ship-wiring cable and a silicone rubber insulated cable. In addition to the usual range of mining cables and accessories, overhead equipment for underground haulage and a new 100-pair plastic colliery telephone cable are shown.

British Power Transformer Co., Ltd., Queensway, Ponders End, Middlesex.—**Stand J.29.**—A new 5·75 kVA, 3-phase automatic voltage regulator is introduced. This unit, model A-13GW, is of the wall mounting type and comprises a motor driven regulator complete with protective gear, limit and alarm switches, provision for emergency hand operation and a control panel incorporating a voltage sensitive relay.

The range of voltage stabilisers now runs from 1 kVA, single-phase, to 115 kVA, 3-phase, falling into three main types: air cooled for wall mounting, air cooled floor mounted cubicle type, and oil cooled.

British Switchgear Corporation, Ltd., Morden Factory Estate, Lombard Road, London, S.W.19.—**Stand P.2.**—Examples are shown of the company's range of h.v. switch and fusegear, knife switches, panels, terminal blocks, l.v. isolating switches, etc.

British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2.—**Stand G.12.**—Electronic equipment displayed includes photo-electric relays operated by a modulated light beam; a high-speed batch counter; synchronous and non-synchronous sequence weld timers; the "Emotrol" (electronic motor control) system; leak detectors; and the newest designs of 16 mm magnetic/optical sound film projectors.

Among electric motors are examples of "Stayrite" single-phase power drives, standard dimension and f.h.p. motors, and displays showing the design of the "K" type three-phase motor. Three of the company's new ventilated motors (type KN-C) are displayed for the first time. These have dimensions in accordance with the proposed draft B.S. dimensions for ventilated motors, and incorporate up-to-date insulating materials which can safely be worked at higher temperatures than in previous designs.

Electromagnetic contactors and control switches represent industrial control gear, while switchgear exhibits include a model of the B.T.H. 300 kV lenticular tank oil circuit-breaker, and a 3-phase automatic circuit recloser for improved continuity of supply on rural transmission lines up to 11 kV.

British Vacuum Cleaner & Engineering Co., Ltd., Goblin Works, Leatherhead, Surrey.—**Stand U.10.**—Four different types of vacuum cleaners, three cylindrical and an upright model, the new "Goblin" washing machines and a complete range of "Teasmade" appliances are exhibited. The company also manufactures portable industrial cleaners, as well as supplying fixed vacuum cleaning

installations, and specialises in pneumatic flue cleaning which removes hot ash while the boilers are under steam.

Electrical timing apparatus is displayed by the Magneta Time Co., a subsidiary company. Equipment shown can be supplied either to operate from a master clock or to be individually operated from controlled a.c. mains.

Britmac Electrical Co., Ltd., 121, Victoria Street, London, S.W.1.—**Stand C.2.**—The "Micromac" 5 and 15 A a.c. switchplugs are an entirely new range and with several features not previously incorporated in Britmac switchplugs. An important development is the provision of locked shutters which can only be opened when all three plug pins enter the sockets. They are available in surface or flush patterns with shockproof covers in white, brown, ivory or squirrel grey, or flush pattern only with metal plates. Also to be seen is the "Little Briton" range of 5 A a.c. flush switch and plate units, designed for competitive installations, as well as a very wide range of installation accessories including watertight switches up to 6-gang.

Brook Motors, Ltd., Empress Works, Huddersfield.—**Stand L.19.**—New exhibits include two starters in the "A" type range, a single- and three-phase reversing starter with a maximum of 2½ h.p. and a three-phase two-speed starter with interlocking isolator, maximum 5 h.p.

A recent introduction is the single-phase "Power Pack," a motor and starter combination designed for the agricultural or small industrial power user. The motor is capable of developing a starting torque of 100/120 per cent of full load torque, with a starting current of 150/175 per cent of full load current by means of a centrifugal switch and electrolytic capacitor. In the f.h.p. motor range a fan cooled type is now available in the smaller sized B.S. 42 type.

A B.S. crane motor, with internal slip-rings, is exhibited for the first time. Other exhibits include control gear for a variety of purposes and a selection of "Gryphon" and "Merlin" f.h.p. motors.

Brookhirst Switchgear, Ltd., Northgate Works, Chester.—**Stand F.5.**—This company's main exhibit is a new design of cubicle switchboard offering extreme flexibility and accessibility, a basic development being its swing-out feature. The control gear is mounted on the inside of the compartment door so that it swings out for inspection when the door is opened. Special lift-off door hinges are fitted permitting a complete starter unit to be instantly removed for servicing or replacement. Plug-in type isolating contacts are employed for incoming and outgoing (and sequence) connections thus dispensing with trailing cables. Each cubicle door handle is mechanically interlocked with the contactor to ensure that the contactor is opened before the door can be unfastened. There is also a demonstration panel illustrating the application of static relay control industrial control equipment, and a representative range of standard a.c. and d.c. hand-operated and automatic starters.

Browning's Electric Co., Ltd., Boleyn Castle, Green Street, London, E.13.—**Stand C.7.**—Magnetic separators, commutators, sliprings, f.h.p. motors, machined parts, electric soldering irons, and a commutator turning and undercutting machine are included in this company's exhibits.

Brush Electrical Engineering Co., Ltd., Loughborough, Leics.—**Stand L.17.**—The products of the company cover steam turbines, turbo-alternator sets, power and distribution transformers, on-load tap changing gear, a.c. and d.c. motors and generators, h.v. and l.v. switchgear, distribution gear, fusegear and h.r.c. fuses.

Bryce Electric Construction Co., Ltd., Kelvin Works, Hackbridge, Wallington, Surrey.—**Stand M.4.**—Exhibits are divided between power capacitors and power transformers. From the transformer range, which extends to 20 MVA at 132 kV, the largest exhibit is a 2,000 kVA 11/3·3 kV 3-phase, 50 c/s transformer removed from its tank for inspection. Another exhibit is a current limiting reactor having a rating of 3,000 kVA at 3·3 kV, also displayed out of its tank. Other transformers include a distribution type to B.E.A. Spec. T1 and a 200 kVA, 3,150/550 V mining type with h.v. circuit-breaker.

P.f. correction capacitors are represented by small units for individual correction, a 100 kVAr 550 V mining type unit, together with capacitors provided with contactors for automatically controlled schemes.

Bulpitt & Sons, Ltd., Swansea Works, Birmingham, 1.—**Stand K.14.**—Among a number of examples from the "Swan" range of domestic electrical appliances are kettles, coffee percolators, fires, toasters, urns, wash boilers, blankets, ground base aluminium holloware and immersion elements. New items include the "Swift" and "Siren" kettles, 3-pint, 2 kW kettles and the "Belgrave" coffee percolator. The last-named appliance is fully automatic and has a capacity of 1 to 2 pints. 3 kW immersion elements, with the latest type shallow head, are shown in lengths ranging from 11 to 36in.

Burgess Products Co., Ltd., Dukes Way, Team Valley, Gateshead, 11.—**Stand J.26.**—The Micro Switch Division shows models designed to meet the need for precision snap-action switching in every branch of industry. Among new micro switches exhibited are a pulse switch; a group of high-precision miniature micro switches; a heavy-duty industrial model; and a totally-enclosed, automatic door interlock switch.

Cable Covers, Ltd., St. Stephen's House, London, S.W.1.—**Stand Q.27.**—Overhead line fittings include line terminating clamps, mid-span connectors, aluminium and copper line taps, adjustable stay rods, stay clamps, tubular earth rods, bi-metal connections, "come along" tongs, running-out blocks, pole pikes, "Talurit" automatic splicing equipment and safety slings. Cable protection covers, stoneware conduits, pin type insulators, and a new house service insulator are other products displayed.

Cayson Electrics, Ltd., 139, Queens Road, Watford, Herts.—**Stand D.13.**—A selection of industrial rectifying equipment incorporating metal rectifiers, suitable for l.v. lighting, portable tools, etc., is shown in addition to a complete range of fluorescent chokes, h.p.f. ballast units and quick-start transformers.

Central Electricity Authority, Winsley Street, London, W.1.—**Stand B.3.**—The Authority's display illustrates and describes the nuclear power station construction programme, with particular reference to the Bradwell and Berkeley stations. Attention is also paid to the progress being made in the construction of larger thermal power stations.

Chilton Electric Products, Ltd., Hungerford, Berks.—**Stand C.9.**—On display is a new "Chilton" shaver socket. It incorporates an isolating transformer with earthed screen between the primary and secondary windings, and is operated by a d.p. switch and protected by a self-resetting thermal trip. "Atlas" miniature circuit-breakers are also exhibited, together with voltage operated and core balance earth leakage breakers for ratings up to 60 A and new metalclad circuit-breakers designed for flush panel mounting. The company is also showing a mains failure alarm; the "Accu-lux" pocket lamp; a portable spin drying machine; a transformer adaptor; electric hair clippers; and dry shavers.

Chloride Batteries, Ltd., Exide Works, Clifton Junction, Swinton, Manchester.—**Stand C.1.**—The section devoted to stationary batteries and associated equipment comprises examples from the wide range of "Keepalite" emergency lighting equipment and includes a new control cubicle shown for the first time. Another introduction is a self-contained "Keepalite" equipment of the maintained type for use in small cinemas, halls, etc.

Clang, Ltd., Cricklewood, London, N.W.2.—**Stand F.1.**—Domestic, industrial and aircraft electrical accessories.

Clare Instrument Co., 8, South Street, West Worthing, Sussex.—**Stand G.2.**—Electrical measurement and test gear equipment includes wattmeter bridges, specialised test gear for the domestic electrical appliance manufacturer, and portable test gear for refrigeration service. Other products on this stand are double-wound variable transformers and surge limiting variable transformers.

H. Clarke & Co. (Manchester), Ltd., Atlas Works, Patricroft, Manchester.—**Stand Q.7.**—Insulating materials on view include laminated Bakelite in sheet, rod and tube form, machined components, high voltage bushings, etc.; pure mica, including high grade condenser films; micanite; and allied insulated materials, including "Empire" tapes, cloths, sleevings, etc. Of particular interest is flexible Bakelite, in sheet or strip form, which can be bent into circles of under 1in diameter without breaking, making it suitable for formers for wire wound rheostats.

E. K. Cole, Ltd., Ekco Works, Southend-on-Sea, Essex.—**Stand E.14.**—The complete range of "Thermovent" electric heating equipment is displayed. Making its first appearance at the exhibition is the new "Thermostor" thermal storage heater available in 2¼ or 1½ kW sizes. Safety measures include the provision of a built-in thermostat to prevent overheating, back radiation screens and a sloping top. Simple installation is ensured by easily handled storage blocks which are built up on site and an accessible terminal arrangement with wiring entries from either side or back.

The range of "Thermovent" "FR" portable convectors has recently been extended to include four new colours—black, ivory, beige and red—in addition to the original polished walnut colour. The "SR" series of metal-cased floor-standing heaters (1, 2 or 3 kW); inset convection heaters; wall mounting convectors; "Radiant Glass" panel heaters; high temperature panels and flameproof and horticultural "Thermotubes" are also being exhibited.

Collinson's Precision Screw Co., Ltd., Forest Road, Walthamstow, London, E.17.—**Stand T.1.**—Turned repetition brass parts for the electrical trades.

H. Comoy & Co., Ltd., 86–92, Pentonville Road, London, N.1.—**Stand U.2.**—Emphasis in this exhibit is on the wide

range of applications of laminated plastics. Examples include synthetic resin bonded laminates with paper, fabric, glass and wood bases; also other insulating materials such as vulcanised fibre, "Perspex," p.v.c., nylon, ebonite, polythene, cellulose acetate and cast resin. Of interest to instrument manufacturers and allied trades are fabricated laminated plastic instrument cases and control panels.

Connollys (Blackley), Ltd., Manchester, 9. — **Stand P.1.** — The Cable Division exhibits conventional types of p.i. mains cable up to 11 kV; plastic cables for power and lighting; ignition cables and flexible cords, and "Blackley" insulating tape. In addition a wide range of telecommunication cables is displayed and thermoplastic types of switchboard cables. The Wire Division's display covers winding wires of all types including "Conyglass," "Conybond," "Conyclad," "Conycote," "Conylitz," "Conymel," "Conysol," "Conytherm" and "Conterex."

Contactum, Ltd., Victoria Works, Edgware Road, Cricklewood, London, N.W.2.—**Stand J.25.**—Wiring accessories include a new heavy duty switch designed primarily for water heaters. There are three models (15 to 30 A), all for surface wiring, one of which has a pilot light. The accent, however, is still on the popular range of 13 A accessories and a.c. switches and switched socket-outlets. Adaptors, flex connectors, junction boxes, etc., complete the display.

Copper Development Association, 55, South Audley Street, London, W.1.—**Stand Q.3.**—Examples of products manufactured from cadmium copper, chromium copper, silver copper and tellurium copper are displayed. Visitors may apply for copies of the Association's publications and members of the technical staff will be available to answer queries on the uses of copper and copper alloys.

Coupleflex, Ltd., 23, Old Burlington Street, London, W.1.—**Stand Q.10.**—Rubber handlamps and safety couplers and the "Simbi" electromagnetic installation hammer.

Courtney, Pope (Electrical), Ltd., Amhurst Park Works, Tottenham, N.15.—**Stand D.7.**—Particular attention is drawn to the "SAX I" lighting system for stores, offices, etc., where large multi-light fittings are required and to an extensive range of modular ceiling fittings available for many types of patent acoustic or false ceilings. A number of luminous ceilings are also exhibited, both flush and baffle, employing a large selection of diffusing panels in glass, fibreglass, corrugated "Perspex," etc. There are also many types of neon signs.

J. A. Crabtree & Co., Ltd., Walsall, Staffs.—**Stand H.10.**—A selection of electrical wiring accessories and motor control gear includes several new products. Besides a wide variety of shockproof "Lincoln" and "Standard" flush and surface mounting tumbler switches and "Lincoln" ceiling switches, there is the recently introduced "Lincoln" 5 A Type "AC" range in one, two, three and four switch arrangements. Other new units include the Type "AC" 5, 13 and 15 A switched socket-outlets, for flush and surface mounting, in shockproof and metal patterns. Other wiring accessories include "Jacelite" and metal plate assemblies, metalclad switches, socket-outlets and indicator units for domestic and industrial purposes, plugs, ceiling roses, lampholders and bell pushes.

The motor control gear selection includes a new range of flameproof remote control stations, available with one, two or three buttons, and limit switches for push-rod, roller, right-angle plunger, and arm-and-roller operation. Type D-6 (hand-operated), Type A-15 (oil-break) and Type B-15 (air-break) starters are also displayed together with a wide variety of remote control equipment.

Critchley Bros., Ltd., Brimscombe, Stroud, Glos.—**Stand Q.11.**—As manufacturers of cable markers, turnings and injection mouldings for the electrical trade, this company exhibits a wide range of interlocking cable ferrules and sleeves, engraved labels, phase buttons, etc. Particular emphasis is placed on the "Beta" system of cable fixing and "Beta" strip offered in 4, 6 and 8 mm sizes, 2 mm strip, buckles and saddles suitable for small wiring (electronic gear) and a 12 mm size for use with larger cables is also shown.

Crompton Parkinson, Ltd., Crompton House, Aldwych, London, W.C.2.—**Stand C.8.**—Switchgear, the core and windings of a transformer, on-load tap changing gear, integral h.p. and f.h.p. motors, lighting fittings, lamps and cable are shown on this stand. The new Series 5 standard ventilated type a.c. squirrel-cage 3-phase motors (1 to 50 h.p.) recently introduced by the company to take advantage of the permissible use of Class E insulation, which allows for motor operation at continuous maximum ratings with a temperature rise of 65 deg C, are shown. Representing the totally-enclosed fan-cooled types which have now been added to the company's 3-phase f.h.p. motor range is a 0·95 h.p. 4-pole foot-mounted motor. There is also a ½ h.p. drip-proof motor in the same range and both conform to the B. 56 frame size, B.S. 2048.

The core and windings of a 500 kVA 3-phase 50 c/s transformer, built to the B.E.T.1 specification, are exhibited as well as an M.D.A. on-load dual drum type tap-changer equipped with mercury switches.

Switchgear exhibits include a standard "Klad" form "A" unit designed for ratings up to a maximum of 1,200 A at 650 V or 400 A at 3·3 kV, while among instruments displayed are ammeters, voltmeters, frequency indicators, p.f. indicators, synchroscopes, wattmeters, tong-test ammeters, and a 3-phase tachometer-generator equipment.

The lighting display includes the "New-Range" industrial and commercial fluorescent fittings, and the new "Storelite" pendant fluorescent fitting specially designed for shop and store lighting. A flush mounting frame, shown for the first time, is designed to enable many of the standard "New-Range" fittings to be recessed into false ceilings. Sample cable lengths shown include rubber, p.v.c., polythene, and cables for mining, ship wiring, welding and house wiring.

R. & A. G. Crossland, Ltd., Cartbridge Lane, Walsall, Staffs.—**Stand K.5A.**—Lighting and heating appliances for industrial, commercial and domestic applications.

Dale Electric (Yorkshire), Ltd., Filey, Yorkshire.—**Stand T.6.**—This company, which manufactures automatic generating plant, shows typical models of its portable petrol and diesel units. Another exhibit is the "Dale" earth prove unit, a device that has been designed with a view to giving the maximum protection against electric shock to operators of portable or other metal housed appliances. The company's "Roll-A-Drum" equipment is a simple, inexpensive device for hoisting cable drums on jacks, and operates swiftly on smooth-running rollers.

Davis Sheet Metal Engineering Co., Ltd., Angel Road, London, N.18.—**Stand E.4.** — Standard "Quick-Fix" cable trunking in various sizes, skirting trunking, flush floor trunking, underfloor trunking with height adjusting inspection floor traps, tap trunking with associated fused tap boxes and overhead busbar trunking are displayed. Other products include busbar risers, a composite switchboard with interconnections and trunking fitted, busbar chambers with either copper or aluminium busbars, general purpose boxes and a new range of fuseboards.

Thomas de la Rue & Co., Ltd., 84-86, Regent Street, London, W.1.—**Stand P.8.**—"Delaron" insulating, copper-clad and glass fibre laminates and "Traffolyte" engraving material.

Delta Technical Services, Ltd., Fairfield Road, Kingston-on-Thames, Surrey. —**Stand J.2.**—The company specialises in the production of pressure, vacuum and flow operated switchgear, and shows examples of its standard models which cover a wide range of applications suitable for industrial and laboratory purposes.

G. P. Dennis, Ltd., Fleming Road, Speke, Liverpool.—**Stand J.7.**—Prominence is given to a range of new "Hi-Style" distribution fuseboards and isolators for industrial and commercial applications. Hinges, lugs and other protruding parts of the normal fuseboard have been eliminated and a variety of chromium locks are available for particular applications. The standard form of lock is a slam catch incorporating a Yale key.

Dexion, Ltd., Maygrove Road, London, N.W.6.—**Stand J.22.**—Practical demonstrations show how "Dexion" slotted angles are used and photographs illustrate their use for switchgear mountings, cable trunking, wiring, etc.

"Diamond H" Switches, Ltd., Gunnersbury Avenue, London, W.4.—**Stand C.11.**—Of interest to manufacturers of washing machines, cookers, drying cabinets, etc., are one-, two- and three-stage hydraulic thermostats with features such as front of panel calibration, positive mechanical indexing in certain positions, plug-in neon lighting, magnetic pre-heat device, etc., together with a comprehensive range of a.c. and a.c./d.c. rotary reciprocating heater switches. For industrial applications such as motor control, a.c. and a.c./d.c. rotary packet and unit type multi-circuit switches (5/60 A, 250/600 V) are shown.

New products include single-stage hydraulic oven thermostats (the operating differential of which can be reduced to very small values) and circular escutcheons and fluted handle dials for 2- and 3-stage oven thermostats. The metal anodised aluminium face of the escutcheons within the chromium bezel can be supplied in a wide range of colours to match the particular colour scheme of the cooker.

Dimplex, Ltd., Millbrook, Southampton.—**Stand A.13.**—Prototypes of four new electric heating appliances included in this display are a domestic infra-red heater, a commercial and industrial infra-red heater, a convector heater and a convector radiant heater. The domestic infra-red heater is of 750 W loading and can be mounted by chain suspension or by conduit. It incorporates a narrow-beam chrome reflector and the tubular sections

are stove enamelled in a wide range of colours. Loadings of the commercial and industrial infra-red heaters are 2½ kW (3ft in length) and 4 kW (4ft). Slim-line styling is emphasised in the convector and convector radiant heaters (2 kW and 3 kW respectively).

There is a selection of Dimplex permanently oil-filled radiators, including flameproof models, and the rest of the display is devoted to electric towel rails, airing cupboard and general purpose heaters (all oil-filled) and skirting board styled convector heaters.

Donovan Electrical Co., Ltd., 70–82, Granville Street, Birmingham, 1.—**Stand F.17.**—Control and distribution apparatus includes a range of direct-on-line starters up to 75 h.p., star-delta and resistance starters of various types, small power relays, latched relays and larger contactors up to 300 A. A comprehensive selection of accessories includes push-buttons, limit and other remote control switches and terminal blocks. Other exhibits are a range of "Donlok," "Safuse" and "Scrutact" switch and fusegear, "Donlok" power switchsockets and interlocked plugs, "Reylovolt" l.v. lighting transformers and "Runtact" power duct.

Dorman Smith Group of Companies, Ordsal Electrical Works, Manchester, 5.—**Stand F.9.**—Visitors to this stand can see many products of the companies in the group, which includes D.S. Plugs, Ltd., British Klockner Switchgear, Ltd., Alorite, Ltd., and Dorman & Smith, Ltd.

Dorman & Smith display an example of a new type of cubicle switchboard built from standardised components; Type "TS" fused switches showing recent design improvements; "Loadmaster" and "Safeset" miniature circuit-breakers and circuit-breaker distribution boards; a complete range of "Dorman" lighting fittings; "ASC" and "Flowline" distribution boards; and h.r.c. cartridge fuse links.

D.S. Plugs exhibit a wide range of domestic and industrial fused plugs and socket outlets, cooker control units, switches, etc. Shown for the first time are an industrial fused plug and socket outlet fitted with an auxiliary lighting point; cooker control units with B.S.546 type socket outlets; cooker control units fitted with push-button type earth leakage trip circuit-breakers; and the "King-Pin" fuse tester torch. This appliance, apart from its use as a torch, also provides a means of checking fuses in domestic plugs, distribution boards, industrial h.r.c. fuses, etc.

The British Klockner Switchgear display covers starters, motor control gear, limit switches, etc., and among new developments is a range of contactors specially developed for use with space heating systems including floor warming schemes. Rated from 10 to 350 A they are suitable for s.p., d.p. and t.p. circuits.

Alorite show examples of ceramics including such products as tri-post terminals, "mini-leads," insulators and h.r.c. cartridge fuse link bodies.

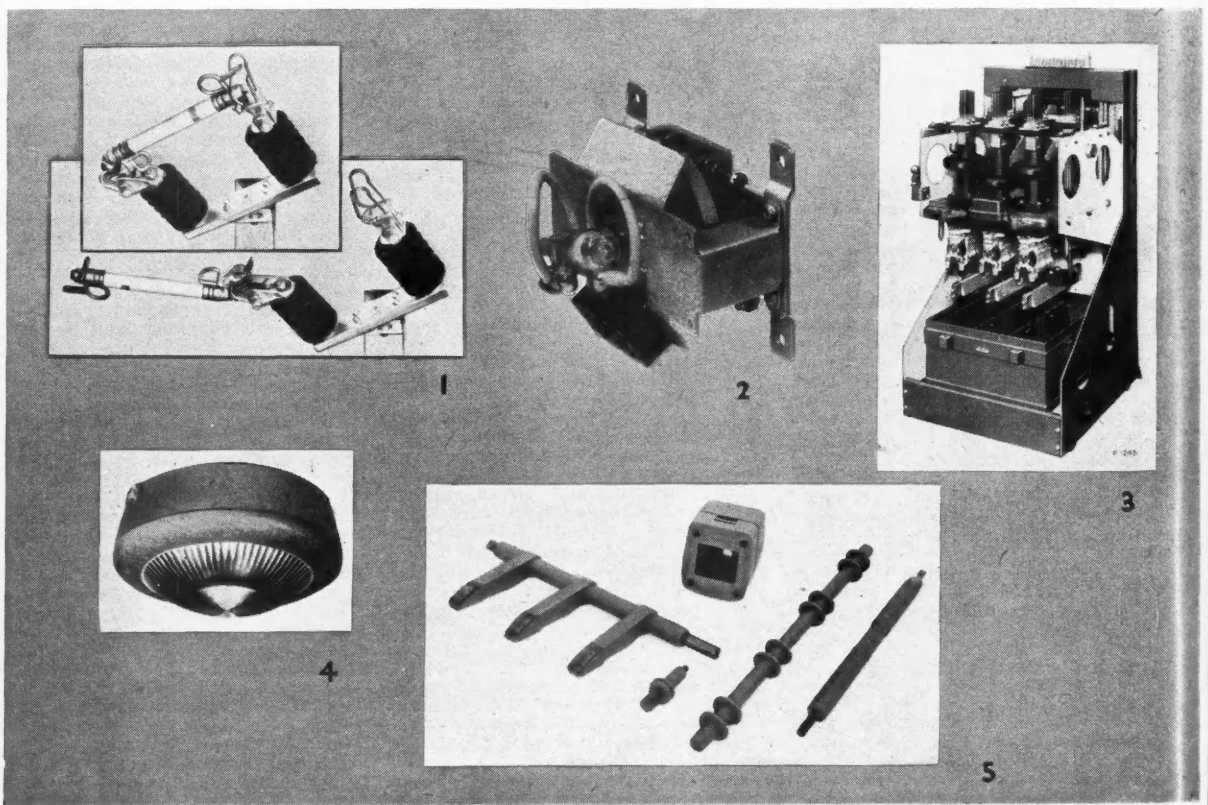
Dowty Group, Ltd., Cheltenham.—**Stand J.28.**—This Group presents examples of the electronic products designed and manufactured by Dowty Nucleonics, Ltd. In addition to a wide range of limit, micro, commutator, drum, lever and push-button switches, together with lamp and electromagnetic two- and three-position indicators, there are also several types of high speed electronic counting equipment.

The requirements of the electrical industry for rubber seals and mouldings are catered for by the wide range of natural, synthetic and silicone rubber items manufactured by Dowty Seals, Ltd. Rubber sealing media displayed include "Seloc" rubber encased lock washers and bonded seal metal and rubber sealing washers.

D.P. Battery Co., Ltd., Bakewell, Derbyshire. — **Stand O.4.** — Of special interest is the new D.P. Kathanode "R" range of batteries for diesel engine starting. Savings in weight, size and cost of about 15 per cent are claimed for these batteries. The company's open and sealed-in cells for all stationary applications are also shown as well as specimen traction batteries.

Dubilier Condenser Co. (1925), Ltd., Ducon Works, Victoria Road, London, W.3.—**Stand L.7.**—Exhibits include p.f. correction capacitors, with automatic control equipment; "Duconol" capacitors for fluorescent lighting; "Drilitic" capacitors for capacitor start motors; automatic voltage and speed regulators; an "NC" automatic servo regulator unit;

1. EMP Electric h.r.c. 11 kV cut-out in closed and open positions. 2. Engel & Gibbs Mk 2 mercury relay. 3. 1,600 A low voltage unit, 25 MVA to B.S.116 (Erskine, Heap & Co., Ltd.). 4. Falk, Stadelmann & Co.'s "Melfort" circular prismatic bulkhead fitting. 5. Group of epoxide moulded products including a cross jet pot, trip arm, switch-fuse, contact carrier and cable earth probe for an 11 kV system (J. R. Ferguson (Electrical Engineers), Ltd.)



electromagnetic mercury switch relays; and tubular slide-wire rheostats and resistances.

E.F. Electric, Ltd., Willow Lane, Watford, Herts.—**Stand J.27.**—The new "Ruby" range of electrical wiring accessories shown for the first time comprises a number of sockets, plugs, switchsockets, etc., moulded in an attractive ruby colour, claimed to blend with any contemporary or traditional colour scheme.

Ega Electric, Ltd., Holyhead Road, Wednesbury, Staffs.—**Stand Q.21.**—This display includes a range of plug-in motor control gear and starters, and "Egatube" non-metallic conduit and fittings. Small power and control relays, incorporating the plug-in feature, are exhibited for the first time. These relays are built on the unit principle, and all parts can be replaced in a matter of seconds. The finger boxes are available in all the usual combinations of contacts and are normally supplied with up to six fingers.

Ekco-Ensign Electric, Ltd., 45, Essex Street, London, W.C.2.—**Stand F.8.**—A wide range of lighting products includes industrial, commercial and decorative fluorescent fittings. Among new products are an 8ft fitting available as a long slim batten or with reflectors for one or two tubes, and an anti-corrosive type of fluorescent fitting suitable for most acid and steam laden atmospheres. Tungsten filament lamps, including the "Softlight" lamp, are also displayed.

Electric Construction Co., Ltd., Bushbury Engineering Works, Wolverhampton.—**Stand F.12.**—Medium and heavy electrical engineering equipment displayed includes a 920 h.p. 6·6/3·3 kV dual-voltage 3-phase 300 r.p.m. synchronous motor designed for auto-transformer starting and air compressor drive for the N.C.B.; a multi-panel heavy-duty contactor control switchboard for controlling 50 kVA standby power equipment in a telephone repeater station and arranged for the completely automatic control of an unattended station; a mercury-arc rectifier equipment; two 1,250 A 125 V germanium rectifier units; a self-regulating alternator complete with automatic voltage regulator equipment; an electronically controlled speed regulator as provided for Ward-Leonard equipments of 150 to 350 h.p. capacities; and an electronically controlled 2 h.p. d.c. motor and control cubicle forming a small variable speed drive, powered from thyratrons to give a controlled speed from 100 to 2,400 r.p.m., arranged as a working model connected to a 200/250 V single-phase supply.

Electric & Ordnance Accessories Co., Ltd., Hanley, Stoke-on-Trent.—**Stand W.6.**—Electrical porcelain for h.v. and l.v. distribution, porcelain bushings and die-made porcelains for electrical accessories.

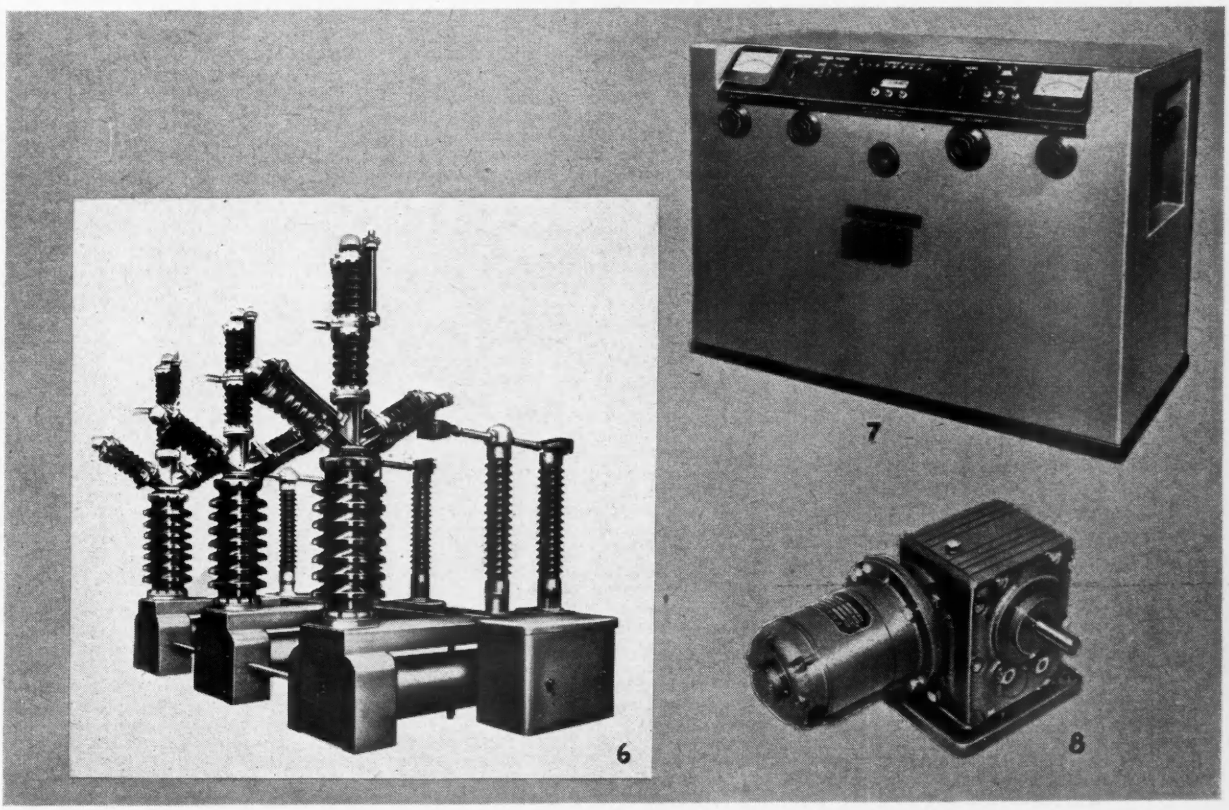
Electrical Apparatus Co., Ltd., New Barnes Avenue, St. Albans, Herts.—**Stand J.8.**—The a.c. and d.c. manually-operated and fully automatic motor control gear and accessories, industrial and flame-proof types, displayed include a new range of direct-on starters and automatic panels. Cubicle type fully automatic switchboards are also shown and there is a section devoted to controllers, airbreak circuit-breakers and a.c. contactor-type units for all types of starting. Accessories include float switchgear, rotary selector switches, local and remote push-button stations, etc.

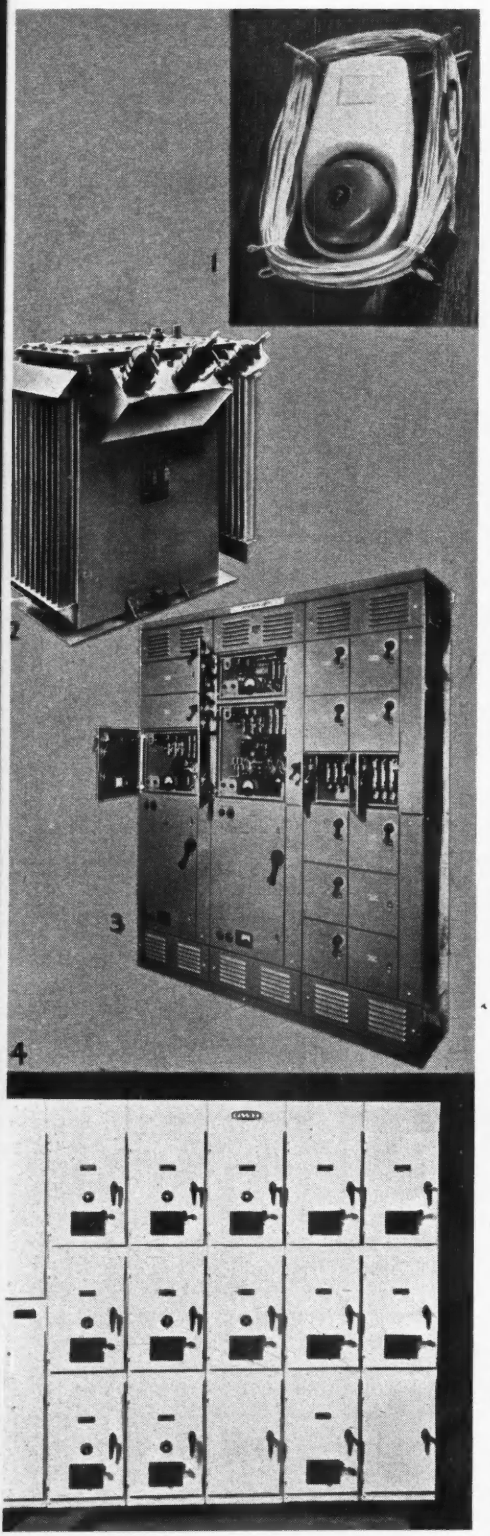
Electrical Industries Benevolent Association, 10, Buckingham Palace Gardens, London, S.W.1.—**Stand B.4.**—This stand, in the form of an information bureau, gives particulars of the activities of the Association. Copies of the Association's year book and other material are available.

Electrical Review Publications, Ltd., Dorset House, Stamford Street, London, S.E.1.—**Stand A.6.**—Representatives are available at this stand to deal with inquiries relating to all matters connected with the electrical industry. Up-to-date and authoritative books on various aspects of electrical engineering are displayed. Of especial interest is "Modern Electrical Contracting" by H. R. Taunton, A.M.I.E.E., which describes the organisation of a contracting business and the routine for operating it.

Electrical Remote Control Co., Ltd., South Road, Templefields, Harlow New Town, Essex.—**Stand T.4.**—Automatic process timers, a range of continuously cycling cam-operated timers, and multiple contact electromagnetic relays (all for operation on a.c. and d.c.) are among the instruments exhibited and a l.v. soldering iron busbar installation and l.v. soldering irons are also shown. New products include a multi-circuit universal automatic timer, type MAT, a universal timing instrument controlling up to eight circuits,

6. Ferguson Pailin CA.10 air-blast circuit-breaker. *7. Ferranti single-phase meter testing set.* *8. Fractional H.P. Motors latest model, C.70*





1. V. & E. Friedland invalid bell set. 2. 100 kVA 3-phase, pole type distribution transformer (Fuller Electrical & Manufacturing Co.). 3. G.E.C. motor control centre for the centralised control of a number of a.c. motors or circuits. 4. Typical G.W.B. Furnaces special purpose control panel

each of which is independently adjustable by the setting of continuously adjustable cams operating change-over switches. The total length of the timing cycle is continuously adjustable and external indication of the progress of timing is provided. The company's standard sensitive relay, type STIV, has been modified and the contacts to frame and coil insulation have been increased, making it capable of withstanding up to 4 kV d.c. contacts to coil.

Electro Dynamic Construction Co., St. Mary Cray, Kent.—**Stand Q.25.**—The company is showing examples of marine equipment, including vertical and horizontal motors and lightweight direct-coupled generators. Alternators, generators and rotary convertors are also displayed. Power plant of special design for use in radar and telecommunications ranges from 25 to 10,000 c/s, with voltage compensators, and other exhibits include f.h.p. motors with governed variable speed to within ± 5 per cent at any pre-set speed within the range of 1,200/10,000 r.p.m.; portable petrol generator sets; rotary convertors and rotary transformers; and a range of control gear, including hand-controlled and automatic starters.

Electro Mechanical Manufacturing Co., Ltd., Marlborough Street, Scarborough.—**Stand A.9.**—The all-isolating cubicle formation and the "Y" unit construction switchgear exhibits consist in both instances of motor contactor starters and fuse switches designed for operating under very difficult climatic conditions in any part of the world, for either indoor or outdoor installation.

Electro Methods, Ltd., Caxton Way, Stevenage, Herts.—**Stand S.10.**—Plugs, sockets and connectors for interconnection of units and sub-units include a range of six multi-way connectors covering 7 to 50 ways. There are also a new range of printed circuit connectors; relays, including time delay and sensitive moving coil types; and a new tachogenerator.

Elliott Brothers (London), Ltd., Century Works, Lewisham, London, S.E.13.—**Stand H.1.**—Electrical instruments and industrial measurement and control equipment of particular interest to supervisory electrical engineers are displayed. Specially featured is a complete range of high-precision instruments including transformer test sets, reflecting dynamometer instruments, and instruments for use as standards and sub-standards. A range of portable and panel-mounting recorders includes miniature, standard and potentiometer types for the recording of all electrical quantities on strip charts with speeds from ½ in/hr to 12 in/min. The new "900" and "1200" models contain three or four movements recording simultaneously. Other exhibits are frequency indicators and recorders, and a high-stability power-frequency generator which provides means for testing at frequencies between 40 and 2,500 c/s with accuracies comparable to those previously obtainable only with d.c.

George Ellison, Ltd., Perry Barr, Birmingham, 22B.—**Stand J.16.**—Exhibits of interest include the recently introduced GEO range of m.v. switchgear, comprising horizontally isolated drawout circuit-breakers, A.S.T.A. tested to B.S.116:1952, for service voltages of up to 660 and with current carrying capacities of 400, 600, 800 and 1,200 A. A range of circuit-breakers and motor starters is also shown, including a 20 A direct-to-line starter with integral isolator and back-up fuses, A.S.T.A. tested to B.S.936:1940. Breaking capacity is 1·5 MVA at 600 V and it is specially suitable for sequence starting.

E.M.B. Co., Ltd., Moor Street, West Bromwich, Staffs.—**Stand S.1.**—High temperature "Edgewound" traction resistance; "Microsen" contactor panel with control circuit operating; a.c. drum type master controller; and various contactors and overloads.

EMP Electric, Ltd., Garman Road, Tottenham, London, N.17.—**Stand Q.26.**—Valve type lightning arrestors for all systems up to and including 380 kV r.m.s., and examples of station, line, and distribution type arrestors are displayed. The h.r.c. fuse range covered is represented by typical samples of current limiting h.v. fuses for air installation at voltages up to and including 132 kV; oil tight tripping fuses tested to B.S.2692; and m.v. fuses A.S.T.A. tested to B.S.88/1952. Of special interest are the load break fuse isolators and disconnects for 11 kV and 33 kV circuits.

E.M.S. Electrical Products, Ltd., Common Lane, Kenilworth, Warwickshire.—**Stand G.7.**—This company's exhibits include the "Uniduct" 3-phase enclosed collector track; "Trolley Duct" single-phase feed rail for mobile power supplies; "Minibus" miniature busbar system; "Miniplug" plug-in duct system for small power tools; and the "Plug Bus" channel system. A new product is the "Trolleymaster" enclosed collector track for "Hi-cycle" tool applications.

Enfield Cables, Ltd., Victoria House, Southampton Row, London, W.C.1.—**Stand L.15.**—This year the company devotes particular attention to its Contracts Department and a team of contract personnel gives daily demonstrations. A wide range of products includes the "Enfield" compression cable; flat oil-filled cable; solid types in both aluminium and copper; multi-core l.v. paper mains cables; rubber and p.v.c. house-wiring and armoured cables; mining and ship-wiring cables, including butyl and silicone insulated types; grid suspension cables and accessories; bare copper wires, strips and strands; aluminium strands; moulded rubber cables; and overhead line materials and joint boxes.

Engel & Gibbs, Ltd., Warwick Road, Boreham Wood, Herts.—**Stand F.6.**—This company exhibits relays, contactors and mercury switches. The new Mk 2 relay has contact arrangements ranging from s.p. types operating on 0·25 W, to t.p. versions handling 30 A. Time switch and combination units can be constructed. The "H" series relay, also shown, has most of the features of the standard E.G. relay, but occupies less space.

Engineering & Lighting Equipment Co., Ltd., Sphere Works, Campfield Road, St. Albans, Herts.—**Stand Q.23.**—An extensive range of control panels, fuse panels, switches, junction boxes, etc., is shown, in addition to street and industrial lighting fittings.

English Electric Co., Ltd., Queen's House, Kingsway, London, W.C.2.—**Stand E.8.**—The Domestic Appliances and Television Division includes among its exhibits refrigerators, washing machines, tumbler dryers, cookers, food mixers and plate warmers. The Electrical Plant Sales Division, in addition to the large industrial motor, exhibits a model salient pole, synchronous induction motor and compressor. The Fusegear Department is showing new fusegear equipment; a super-form fuseboard; a combination fuse switchboard; a substation fuseboard;

pole mounted fuse fittings; and cartridge fuseboards. In the new "Red Spot" range of metalclad fuseboards shown for the first time the fuse carriers and bases are so designed that no matter how the fuse carrier is held it is impossible for "live" metal to be touched.

The F.H.P. Motor Department's display includes 16 motors of various types as well as cut-away models showing constructional details. The "Fantom" motor, with blowers, as used in school ventilators, is demonstrated in action. Five new ranges of motors are exhibited by the Industrial Motors Division, namely a B.S. range of ventilated motors; totally enclosed loom motors; steel barrel flameproof motors; totally enclosed fan cooled slipring motors; and d.c. protected machines.

The Meters, Relays and Instruments Division shows instruments, meters and relays of the latest designs mounted on panels.

The Stafford and Liverpool Transformer Division exhibits transformers which cover 5, 15, 25, 50, 100, 300 and 500 kVA ratings. Typical transformer windings are also shown, as well as floor, pole and platform mounting transformers. The Switchgear Department show 11 kV, 250 MVA, Type "CV" switchgear and 3·3 kV, 250 MVA, Class "E" switchgear.

Erma, Ltd., Hong Kong Works, Exhibition Grounds, Wembley, Middlesex. —**Stand U.6.**—On display are solderless terminals and cable lugs, hand and hydraulic crimping tools, wire strippers and "Quickie" collet fixtures.

Erskine, Heap & Co., Ltd., Lancashire Switchgear Works, Broughton, Manchester, 7.—**Stand E.11.**—Examples of the company's range of switchgear and motor control gear include switchgear up to 11 kV, 250 MVA A.S.T.A. tested rupturing capacity; l.v. switchgear; d.c. circuit-breakers; knife switches; fuses; isolating links; moving iron ammeters; and voltmeters. A range of contactor type motor control gear is also exhibited.

Everett Edgcumbe & Co., Ltd., Colindale Works, Colindeep Lane, Hendon, London, N.W.9.—**Stand M.2.**—A special feature of this company's display is the "Synclock" synchronous self-starting motor which is employed as the power unit in modern automatic control applications. An extended range of these motors as well as process timers, contactors and an operations "grapher" are shown. The latest developments in graphic or recording instruments are on view, as well as an extensive range of indicating instruments, including ammeters, voltmeters, wattmeters, frequency meters, p.f. meters and synchroscopes.

Evershed & Vignoles, Ltd., Acton Lane Works, Chiswick, London, W.4.—**Stand K.4.**—"Megger" testing instruments on display include insulation testers, insulation and continuity testers, circuit testing ohmmeters, bond testers, earth testers and "Bridge-Megger" testers. Among the insulation testers are hand driven, motor driven and mains-operated models in both single- and three-voltage form, ranging from the small Series 3 instrument measuring up to 50 megohms to the Series 1 instrument measuring up to 100,000 megohms.

A display of chart recorders includes switchboard and portable instruments of both the moving iron and moving coil types. The extremely compact and versatile miniature recorder is shown in its new Mk 2 form. Other exhibits include a "Ionic" water/steam purity testing cubicle incorporating a conductivity indicator and chart recorder.

Expanded Metal Co., Ltd., Burwood House, Caxton Street, London, S.W.1.—**Stand U.11.**—A feature of the "Expamet" display is a grain dryer comprising heater, fan and control panel. Examples of loading resistors, motor coach resistors, duct heaters and industrial space heaters are also shown. "Cressall" products include asbestos woven resistor grids and nets; rotary rheostats and potentiometers; sliding rheostats; fixed and pre-set tubular resistors; shunt field rheostats; and steel jacketed heater units.

Falk, Stadelmann & Co., Ltd., 91, Farringdon Road, London, E.C.1.—**Stand H.6.**—Emphasis is placed on electrical accessories, particular attention being given to the "Snapfast" domestic switch, a new product in which the plate fixing screws have been eliminated.

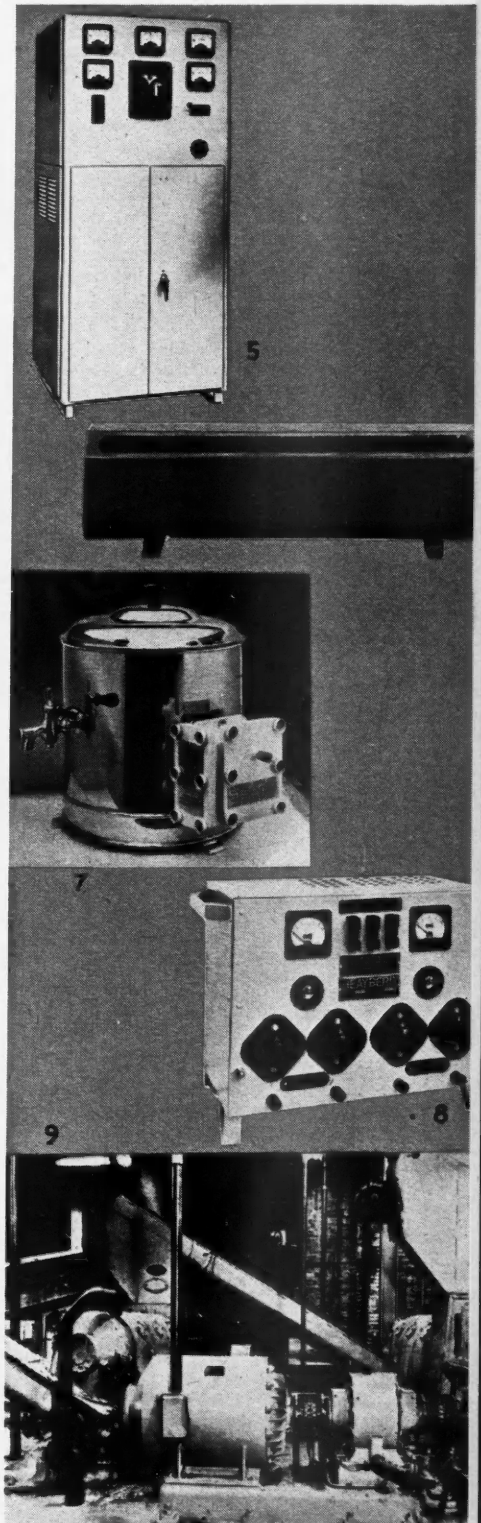
Lighting fittings form a substantial part of the display and among those shown are a new range of fluorescent fittings, new contemporary tungsten fittings, and two new prismatic bulkhead fittings, the "Melfort" and "Marden," in die-cast aluminium alloy.

Fenton, Byrn & Co., Ltd., Berrylands Road, Surbiton, Surrey.—**Stand J.19.**—Ventilation and heating products include a new light duty 12in fan suitable for general ventilation purposes, and a 24in propeller fan for use on single- and three-phase a.c. supplies in a range of speeds and capacities.

J. R. Ferguson (Electrical Engineers), Ltd., Tameside Works, Park Road, Dukinfield, Cheshire. — **Stand L.17.** — Epoxide resins are now coded for the first time in the new B.S.2757:1956 as Class "E" insulation, with the 120 deg C temperature limit. New developments shown include a ring main unit for 11 kV systems, in which the busbars and spouts are totally enclosed in an epoxide moulding weighing 30 lb. This method of construction is claimed to be the forerunner of basic changes in design for switchgear of this class.

Ferguson Pailin, Ltd., Higher Openshaw, Manchester, 11.—**Stand G.8.**—The principal exhibits are a 33 kV 1,000 MVA Type VSLP9 indoor metalclad switch unit and a 132 kV Type CA10 outdoor air-blast circuit-breaker. The Type VSLP9 switch unit is a further development of the vertically isolated design pioneered by the company and is intended for use in power stations and primary substations. The 132 kV circuit-breaker comprises three single-phase units, each consisting of a chassis, with a solid drawn air receiver built in, supporting three porcelain insulators. The blast valves, which control the air supply to the interrupters, are mounted at the base of the air inlet tubes and are of aluminium alloy construction to ease handling and maintenance. A Type OFS oil-immersed fuse-switch designed for indoor or outdoor service is also shown, and a display of auxiliary products includes control switches, moulded current and voltage transformers, instrument switches, fuses and secondary wiring components.

Ferranti, Ltd., Hollinwood, Lancs.—**Stand L.18.**—Among meter products on show is a range of house service electricity meters including a.c. single-phase, prepayment, polyphase and polyphase maximum demand types. The meter display also includes a demonstration of a single-phase meter test set and the conversion unit of a high speed testing set



5. Hewittic 5 kVA self-excited invertor. 6. Heatovent semi-direct storage heater. 7. Heatrae flameproof urn. 8. Typical Heayberd supply unit for use in school science laboratories. 9. Water cooled coupling (right foreground) of the type manufactured by Heenan & Froude, Ltd.

for a.c. meters. The Instrument Department is represented by several demonstration units and a selection from a range of indicating and industrial instruments including hermetically sealed types.

Instead of working on the current injection principle recommended in Regulation 507, a new phase-earth loop impedance tester momentarily puts an actual fault from line to earth and is operated by the fault current, a method considered to be far superior to any l.v. test. Other new items are an 11 kV pole type clip-on ammeter and a proving unit for use with h.v. indicators. A demonstration model of the company's seven-range clip-on volt-ammeter, Type " V," is also shown.

Transformer products include large power transformers, moving coil voltage regulators, distribution transformers, including " lock wound core " types and a special display of a transformer with Class " H " insulation. Also to be seen is the " Pegasus " digital computer, suitable for a wide variety of applications, both in the scientific and technical field and in business and accountancy; a high speed tape reader, an instrument for reading from punched paper tape, using photo-electric action; and silicon junction diodes and power rectifiers. Foundry products are also shown and the display is completed with a show of domestic electrical appliances, including the " Fridge-Heater " Mk II and a selection of radiant electric fires and convectors.

Fibreglass, Ltd., Ravenhead, St. Helens, Lancs.—**Stand U.4.**—Fibreglass textiles are shown as the base material for a wide range of electrical insulating products, including flexible woven cloth and tapes, both untreated and varnished, magnet wire and cable insulation, braided sleevings and resin-bonded laminated materials. Applications of the materials in " end products " are demonstrated, particular attention being drawn to the new Class " H " insulation which is finding increasing use in transformers, machines and other electrical equipment.

Fitzgibbon & Murray, Ltd., Lower Mill, Ewell, Surrey.—**Stand B.1.**—" Jeani " and " Ewell " electrical accessories and " Hi-Scale " wire connectors.

Fractional H.P. Motors, Ltd., West Heath Works, Rookery Way, Hendon, London, N.W.9.—**Stand J.23.**—Besides a comprehensive range of a.c./d.c. universal, shunt, split-phase, three-phase, capacitor, synchronous, and shaded-pole motors ranging from $\frac{1}{250}$ to $\frac{1}{3}$ h.p. there are geared units from 0·125 to 600 r.p.m., torque up to 850 lb/in. The company's latest model, C.70, is also on view.

V. & E. Friedland, Ltd., Macclesfield, Cheshire.—**Stand F.3.**—In this exhibit of bell and chime equipment there are bells and buzzers, push-buttons and contacts, bell transformers, transformer night lights, desk push sets, invalid bells, etc. A complete bell kit for the " do-it-yourself " market is also shown.

Fuller Electrical & Manufacturing Co., Ltd., Fulbourne Road, London, E.17.—**Stand F.13.**—An on-load tap changer is exhibited as a complete working assembly with electrical driving mechanism and control desk. It is typical of a complete range of high speed resistor tap changers suitable for 3-phase power transformers with ratings from 10 MVA to over 200 MVA and current ratings from 200 to 800 A at service voltages of 33 and 66 kV, and for use at the neutral end of 132 and 275 kV windings. An elliptical gear five-wheel unit, as employed in the complete tap changer for the drive of the selector switches, is shown separately. The core and winding assembly of a 750 kVA transformer is also shown, the unit being built in accordance with B.E.S. T.1 (1954) ratio 11,000/433 V, 3-phase, 50 c/s, with off-circuit tapping switch. A complete photographic display has been arranged to show the various stages of transformer manufacture.

General Cable Manufacturing Co., Ltd., Leatherhead, Surrey.—**Stand Q.35.**—An extensive range of rubber, thermoplastic, paper and varnished cambric insulated cables is displayed jointly by this company and Britannic Cables, Ltd. Special types of aerial cable are included. Among new products is an improved type of straight-through joint box for armoured and unarmoured thermoplastic insulated and sheathed cables.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—**Stand J.15.**—Representative types from each of the company's complete ranges of domestic, industrial, weatherproof and flameproof switchgear are shown and there is a model of the atomic power station that the company is to build for the South of Scotland Electricity Board.

A new range of direct-to-line motor starters, Series " XB," " XC " and " XD," for use with motors up to 7 h.p., from 10 to 12½ h.p. and from 15 to 30 h.p., respectively, is exhibited. The starters are available with or without interrupter switches, and it is noteworthy that the switches are capable of breaking a stalled motor current up to ten times that carried on full load.

Equipment has been developed for the centralised control of a number of a.c. motors or circuits. It is essentially a cubicle which will accommodate a wide range of starters and switch fuses for operation up to 600 V. The individual control units are built to plug in to the cubicle so that not only is the maintenance simplified but units of the same rating may be easily interchanged. Any number of cubicles may be coupled together to form a compact switchboard.

In a display of heating, lighting, cooking and food storage equipment attention is drawn to the requirements of the Clean Air Act and food hygiene regulations. Among the equipment shown is a photo-electric smoke-density monitor.

Gent & Co., Ltd., Faraday Works, Leicester.—**Stand L.6.**—A novel domestic fire alarm, the " Blaze-larm," is a self-contained unit which is actuated by a bi-metal strip that " triggers-off " a loud-sounding mechanical bell. Provision is also made for operating an extension bell which may be fixed a considerable distance away. In addition to the large range of bells available from this company a new all-in-one bell, the " Neatabell," is shown for the first time. A display of industrial fire alarm systems includes the new " Strident " siren. There is also a selection of clocks, available for either mains operation or master clock control, and working exhibits of time recorders, indicators, signalling systems, staff locating equipment, etc.

Gilflex Conduits, Ltd., 41, The Parade, High Street, Watford, Herts.—**Stand P.3.**—The main exhibit consists of the company's standard and industrial non-metallic conduit wiring systems. One innovation is a rigid p.v.c. compound conduit which is self-threading into the accessories provided, a patented feature, and also incorporates the telescoping of different sizes.

Gillott Electro Appliances, Ltd., Cotswold Works, Chalford, near Stroud, Glos. — **Stand G.5.**—The " Newday " space heater, of which free-standing and inset models are shown, incorporates a 3 kW fan for boost heating and 1·5 kW convection for background heating. Fan operation is controlled by the " Chronomatic " automatic time control. Other heater exhibits are the " Chalford " convector (1 kW), the " Gloucester " convector (1·5 kW switched to 750 W) and the " Cotswold " fan heater (1·5 kW). Immersion heaters are also displayed.

W. T. Glover & Co., Ltd., Trafford Park, Manchester, 17.—**Stand L.23.**—The wide range of cables exhibited includes pre-impregnated p.i. types and v.r.i. cables and flexibles; conventional types of plastic cable; and samples of recently developed cables including " Nylon," heat resisting p.v.c., cellular and irradiated polythene.

John Gosheron & Co., Ltd., Albert Embankment, Vauxhall, London, S.E.11.—**Stand W.4.**—New additions to a wide range of tapes for electrical insulating purposes on view include " Dilec " p.v.c. electrical insulation tape, " Vylap " pipe wrapping and protection tape and " Transolec " polythene tape.

Griffiths Bros. & Co. London, Ltd., Armour Works, Well Lane, Wednesfield, Staffs.—**Stand J.6.**—New products to be seen for the first time are " Pakyderm 463," a non-spirit finishing varnish particularly suitable for application by spray as well as by brush, and " Red Insulderm " anti-tracking enamel, claimed to be highly resistant to oil and moisture. In addition, the properties of " Armour Brand " insulating varnishes and production finishes are demonstrated.

G.W.B. Furnaces, Ltd., P.O. Box No. 4, Dibdale Works, Dudley, Worcs.—**Stand L.9.**—A selection of special purpose control panels, both for a.c. and d.c. applications, are displayed. Panels illustrate the open type construction and ease of access for maintenance which can be effected from the front and one separate open frame contains a selection of G.W.B. contactors, from 10 to 1,400 A a.c. and d.c., so that special features such as the sintered tungsten-silver contact faces may be examined. A second open frame contains a selection of isolators which range up to 1,400 A.

Hackbridge & Hewittic Electric Co., Ltd., Walton-on-Thames, Surrey.—**Stand D.10.**—The core and coils of a standard 1,000 kVA transformer; a Class " C " (fire resisting) rectifier transformer; on-load tap changing gear complete with control cubicle; a model of a 120 MVA 275/132 kV transformer; and a 50 kVA distribution transformer are part of this company's display. There is also a self-excited 5 kVA invertor for obtaining a.c. from d.c. independently of any external a.c. supply.

J. Edward Hall (Elec. Engineers), Ltd., Clarence Road Works, Leeds, 10, Yorks.—**Stand V.6.**—Prominent among industrial electronic exhibits is a full range of Mk III " Proxicon " level control equipment incorporating a new relay trigger circuit to give positive relay snap action under all operating conditions. A working model " Proxicord " continuous level indicator is shown which in its latest form with selector switch will monitor three separate containers. There is also a range of standard and heavy-duty electrodes displayed for use with these

devices, and examples of the " Lumicon " lighting controller and " Revicon " speed indicating equipment. New products include a single-electrode "Proxicon" high-differential level controller; a multiple pillar-type continuous level indicator designed to monitor up to twelve containers; and a photo-electric relay for heavy industrial use.

Harris & Sheldon (Electrical), Ltd., Ryder Street, Birmingham, 4.—**Stand K.7.**—Typical items from the " Handslite " range of lighting equipment and ancillary products provide a representative cross-section of modern and traditional lighting as applied in industry, offices, stores, public buildings, and the home. Fluorescent and tungsten fittings are shown and also examples of Venetian glass and wrought iron designs and tableware in matching suites. The " Luve-Tile " illuminated ceiling system is represented by a demonstration area and photographs.

Hawke Cable Glands, Ltd., Ashworth Street, Denton, Lancs.—**Stand P.6.**—Cable glands and sealing boxes suitable for flameproof and non-flameproof installations; joint boxes; through boxes; and sealing ends for busbar termination.

L. G. Hawkins & Co., Ltd., 30–35, Drury Lane, London, W.C.2.—**Stand L.20.**—Among a wide variety of domestic appliances, including kettles, tea-makers, food warmers, fires, hair dryers, etc., is a new range of convectors available in six colours and the " El-Boilo " rapid liquid heater.

Heatovent Electric, Ltd., Lomond Street, Glasgow, N.2.—**Stand F.16.**—As well as showing their standard exhibits of convector heaters, fan heaters, " Tuvec " heaters, radiant and flameproof units, together with general space heating appliances for industrial use, this company is exhibiting a semi-direct electric storage heater controlled by a room thermostat which is claimed to be the first of its kind to be produced. As the surface temperature is comparatively low no special wire guards are necessary. Another product shown for the first time is a heating unit for a drying cabinet available in many sizes and loadings to suit individual cabinets or communal laundries.

Heatrae, Ltd., Heatrae Works, Norwich.—**Stand J.4.**—This company's exhibits include the " Lido " single point water heater available in 1½ and 3 gal sizes; the " Saferod " high level heater and the " Multirod " high level overhead radiant heater for industrial and commercial use; " Slimrod " immersion heaters; cistern and pressure type storage water heaters; an airing cupboard heater; a combined air warmer and towel rail; and hot water urns.

There is also a 10 gal bulk water boiler for canteen use. The principle of operation is based on a bulk storage of water held at 180 deg F by means of a 4 kW element. When boiling water is required, a second 4 kW element is switched into circuit to achieve the final temperature rise within a matter of minutes.

A flameproof urn exhibited is typical of the company's standard range of flameproof urns, available in 2 to 10 gal sizes, with loadings from 1½ to 5 kW for use on a.c. or with separate flameproof contactor switch for d.c.

F. C. Heayberd & Co., Ltd., Greenwich South Street, London, S.E.10.—**Stand V.7.**—Examples of transformers, which range from 2 VA to about 50 kVA, include models for l.v. lighting and for the safer operation of hand tools and inspection lamps. There are many types of battery chargers, including a model for operation from d.c. mains; rectifier units suitable for single-phase and for three-phase inputs; and, shown for the first time, a number of prototype equipments employing germanium rectification, including a school supply unit.

Heenan & Froude, Ltd., Worcester.—**Stand Q.24.**—A " Heenatone " programme control unit designed for a repeated cycle of operations is shown controlling a variable speed drive in accordance with a pre-selected sequence. There is also a new range of liquid cooled " Heenan-Dynamatic " couplings which forms an addition to the company's air-cooled types. Sizes are available to cover up to approximately 1,000 h.p., giving infinitely variable speeds against constant torque loads down to zero speed. Included in the working exhibits is a drive for automatically controlling the rate of feed of cereals in a grinding mill, where a wide range of speeds is needed for the various types of grain.

Hedin, Ltd., Raven Road, South Woodford, London, E.18 —**Stand E.5.**—Industrial heating equipment exhibited includes furnaces, ovens, humidity cabinets, elements, resistance units, etc.

W. T. Henley's Telegraph Works Co., Ltd., 51-53, Hatton Garden, London, E.C.1.—**Stand G.15.**—A selection from the company's wide range of cables and distribution equipment places emphasis on examples of cables incorporating modern synthetic insulating materials. One of these is butyl rubber, which offers many advantages over conventional vulcanised rubber or varnished cambric as a cable insulation for ship-wiring work and for special applications where heat and moisture-resisting properties are required. The heat-resisting properties of silicone rubber are made use of in " Tersil " cables, examples of which are shown. A new winding wire, " Superester," with a polyester coating and outstanding mechanical strength and heat resistance is also shown.

Among mains cable exhibits are samples of the 33 kV 3-core oil-filled cable which the company is installing for the Kent Coast railway electrification scheme.

A service fuse and connector box which fit directly below meters, earth-leakage circuit-breakers and consumers' control units are included in the distribution equipment on view.

Hirst Electronic Development, Ltd., Gatwick Road, Crawley, Sussex.—**Stand E.13.**—Included in the range of products exhibited are precision welding machines up to 75 kVA; welding controls; high speed contactors, a.c. and d.c. up to 1,000 A; rectifiers; transformers; magnetic amplifiers; coil winding magnetising equipment; and air conditioned welding and assembly benches.

Holophane, Ltd., Elverton Street, London, S.W.1.—**Stand E.1.**—Exhibited for the first time is the " Holoflux " system of fluorescent lighting, which embodies a new method of prismatic light control suitable for a wide range of commercial lighting applications. The range includes two- and three-lamp fittings in pendant, close-ceiling and recessed models.

There is also a comprehensive range of prismatic units for offices, public buildings, churches, etc., including translucent fittings and the " In-Bilt " range of flush, recessed and semi-recessed fittings for architectural schemes. Industrial units cover flameproof, dustproof and vapour-proof fittings for specialised applications, while for public service there is a practical range of interior and exterior units for floodlighting rail-yards, docks and sports grounds.

Honeywell-Brown, Ltd., 1, Wadsworth Road, Perivale, Greenford, Middlesex. — **Stand Q.9.** — A comprehensive selection of " Honeywell " micro switches includes sub-miniature, V3, Type A, high capacity, industrial, d.p., double-throw and aircraft types. Among the exhibits are many new assemblies consisting of the basic switch units with special actuators. Visitors are able to inspect prototypes of new switches.

Hoover, Ltd., Perivale, Greenford, Middlesex. — **Stand N.4.** — Included among f.h.p. motors is a new range having a welded steel shell construction. These motors (Mk IV) are at present made in ⅛ and ¼ h.p., single-phase, split-phase and capacitor start only, 1,425 r.p.m., 50 c/s, and are particularly suitable for incorporation in domestic appliances. The Hoover range also covers shaded pole and capacitor run motors, suitable for air conditioning units, ventilating and extraction fans and similar applications.

Hotpoint Electric Appliance Co., Ltd., Crown House, Aldwych, London, W.C.2.—**Stand J.12.**—The new Hotpoint " Princess " washing machine is prominently displayed among the company's range of home laundry equipment and 3-dimensional colour transparencies and drawings stress the finer points of design and manufacture.

The 1957 range of " Coldrator " refrigerators on view includes the new CT.36 and CT.50 table high models and the VF.54, the only upright home deep freezer at present available. The new Hotpoint H.50 refrigerator has a table top of armoured plate glass and a " Buttador " as incorporated in the " Coldrator " CS.81.

A new 2 kW convector heater, at present available only in London, the Midlands and North West, may also be seen. It has a special air duct (similar to a chimney) in the base of which the element is situated. This means that a more rapid flow of much warmer air is forced out through the grille and heat loss through the body is the minimum. A range of radiant rings and " Torribar " sheathed wire elements, including the dual-purpose " Twinimerser " immersion heater, completes the display.

H.V.E. (Electric), Ltd., Viaduct Works, Kirkstall Road, Leeds, 4.—**Stand T.5.**—Convectors of a new design, electric heater batteries for grain drying purposes, fan unit heaters, and tubular heaters, together with their respective control equipment, are displayed. The company's special method of floor heating, the principal feature being its low installation cost through the formation of ducts in the concrete flooring using inflatable rubber tube, is also shown in detail.

A. H. Hunt (Capacitors), Ltd., Bendon Valley, Garratt Lane, Wandsworth, London, S.W.18.—**Stand O.6.**—A new range of " Therminol " capacitors claimed to represent a notable advance in capacitors for p.f. improvement, is introduced by this company. The special non-inflammable impregnant and coolant employed in the construction has a high dielectric constant which enables smaller dimensions to be achieved without loss of dielectric strength, but with economy in price compared with normal oil-impregnated types. A further feature is that they can be operated at temperatures up to 60 deg C ambient. The initial range covers values up to 21·5 kVAr and

the construction is such that with the reduced sizes the units are not only desirable for individual application, but are also suitable for racking up into banks to a large value of kVAr.

Illuminating Engineering Society, 32, Victoria Street, London, S.W.1.—**Stand Q.13/K.**—Exhibits include demonstrations of the relationship between lighting and seeing, and examples of the type of work done by lighting engineers.

Imperial Chemical Industries, Ltd., Imperial Chemical House, Millbank, London, S.W.1.—**Stand L.10.**—Products on show include silicone rubbers for extrusion insulating and slipper compounds for use in silicone-insulated cables.

Industrial Tapes, Ltd., Speedfix House, 142/146, Old Street, London, E.C.1.—**Stand T.8.**—"Speedfix" self-adhesive tapes for electrical requirements include aids for printed circuit production, coil winding pressure sensitive tapes and identification tapes.

Insulating Components & Materials, Ltd., 27, Willowbrook Road, Peckham, London, S.E.15.—**Stand Q.1.**—Machined and fabricated components in all types of electrical insulating plastic laminates.

Insuloid Manufacturing Co., Ltd., Sharston Works, Leestone Road, Wythenshawe, Manchester.—**Stand U.3.**—Insulated cable clips in p.v.c., acetate and Nylon, ring lock bushes, adjustable cable saddles, and the "Cradleclip" wiring system.

Ioco, Ltd., Netherton Works, Anniesland, Glasgow, W.3.—**Stand U.5.**—Laminated plastics, electrical insulating cloths and tapes, and materials for printed circuits.

Ionlite, Ltd., 89, Scrubs Lane, London, N.W.10.—**Stand H.6.**—The "Hygeialite" totally enclosed lighting fitting shown by the company is primarily designed for use in food factories in order to comply with the regulations. Provision is made for two, three or four tubes.

Irish Cables, Ltd., 106, Garratt Lane, London, S.W.18.—**Stand W.9.**—(*See* Wandleside Cable Works, Ltd.)

Isopad, Ltd., Barnet By-Pass, Boreham Wood, Herts.—**Stand M.7.**—The company's range of "Isotapes," flexible electric heating tapes, has been increased and types for fuel oil installations, flameproof areas and frost protection, are displayed. "Isopanels" for the heating of storage tanks and lately also for road tankers are shown, in addition to drum heaters which facilitate the emptying of drums containing viscous or solidified material. The Domestic Division shows the "Isoblanket Lana BS" electric blankets.

Jackson Electric Stove Co., Ltd., Dallow Road, Luton, Beds.—**Stand W.5.**—The company is showing a representative range of electric cookers, convectors, fires and wash boilers. New products include a fast boiling plate and the Jackson "Ego" "Speedring." Additions to the "Joy" series 392J and 394J cookers include a large size glass oven door and heated drawer.

Jeary Electrical Co., Ltd., 132–142, East Road, London, N.1.—**Stand J.9.**—Besides propeller and axial flow fans, from 9 to 36in, including flameproof types, and the new polythene protected "Aerofoil" fan designed for fume cupboards, there is a range of geared f.h.p. motors.

Johnson, Matthey & Co., Ltd., 73–83, Hatton Garden, London, E.C.1.—**Stand S.12.**—The contact display is divided into two sections, the first dealing with the many applications in which JMC contacts are used, and the second with the numerous forms in which they are available. Part of the latter section is devoted to standard forms and includes the recently introduced series of composite tubular rivets.

Johnson & Phillips, Ltd., Charlton, London, S.E.7.—**Stand K.8.**—In the power cable section of this stand the new "Junal 5" solder flux for the jointing of aluminium conductor cables is shown. H.v. switchgear for ratings up to 11 kV is represented, together with a range of l.v. industrial type switchgear, and also on view are the company's wound-core rural distribution transformers.

Jones & Stevens, Ltd., Long Lane, Littlemore, Oxford.—**Stand Q.15.**—New miniature a.c. motors having particular application for cooling, pilot or servo uses are shown, the smallest measuring only 3 by 2in with an input of 10 W. Other motors up to 50 W input are available and all types can be fitted with either open or enclosed reduction gears. A newly designed mechanically operated miniature speed control (speed regulation from 2·5 to 2,000 r.p.m. can be obtained) is also on view. Other exhibits are a miniature laboratory stirrer fitted with high and low speed shafts complete with key type chucks and the "Dragonfly" 6½in electric fan suitable for both commercial or domestic use.

Joyce Electrical Co., Ltd., 5a, Goldsmith Road, London, E.10.—**Stand P.9.**—Exhibits include the company's new "Joyleco" electric ceiling fan, metal melting pots, a range of electro-magnetic relays including mercury switch types, air break contactors, solenoids and special purpose electromagnets.

Kent Bros. Electric Wire Co. & E. H. Phillips, Ltd., Kew Works, Bracknell, Berks.—**Stand F.14.**—High conductivity copper winding wires and strips insulated with cotton, silk, rayon, paper, enamel and synthetic enamel.

Key Engineering Co., Ltd., 4, Newgate Street, London, E.C.1.—**Stand P.4.**—Examples of "Key" fibre under-floor duct and fibre conduit.

James Kilpatrick & Son, Ltd., Kelvin House, River Cart Walk, Paisley.—**Stand M.6.**—Examples of "custom built" switchgear.

Klaxon, Ltd., 49, Upper Brook Street, London, W.1.—**Stand L.1.**—F.h.p. motors and geared motor units; industrial audible warning signals; sign and signal flashers; staff locators; and "Latex" test apparatus.

Lancashire Dynamo & Crypto, Ltd., Trafford Park, Manchester, 17.—**Stand E.9.**—Exhibits range from standard machines to special demonstration sets. The latter includes a Class "H" insulated motor working in a high ambient temperature and a self-regulating alternator driven by a non-excited synchronous motor. There are also a 300 h.p. flameproof 2-pole squirrel-cage motor, a tandem lift motor, a 500 kW alternator and exciter, a motor fitted with a built in electro-mechanical brake and a selection from the wide range of geared units, f.h.p. motors and standard a.c. induction motors.

The Rectifier Division of Lancashire Dynamo Nevelin, Ltd., exhibits mercury arc rectifiers up to 2,000 kW, and the Switchgear Division shows the "Unifront" load distribution centre, a specially designed cubicle switchboard incorporating dust-tight switches, motor starting contactors, etc.

Langley London, Ltd., Kelvin Way, Crawley.—**Stand A.1.**—Electrical insulating materials on display include examples of the company's products used in all branches of the electrical, radio and electronic industries. Mica, Micanite and "Lantex" laminated plastic materials include those manufactured on bases of glass with phenolic and silicone resins.

Laurence, Scott & Electromotors, Ltd., Gothic Works, Norwich.—**Stand M.5.**—Numerous working demonstrations feature the N–S variable speed a.c. motor which is shown arranged for simple hand control of speed, with "Asrec" automatic control, and with "Velonic" control. Another exhibit shows a model crane hoist motor powered by a slipring motor with "Revcon" control.

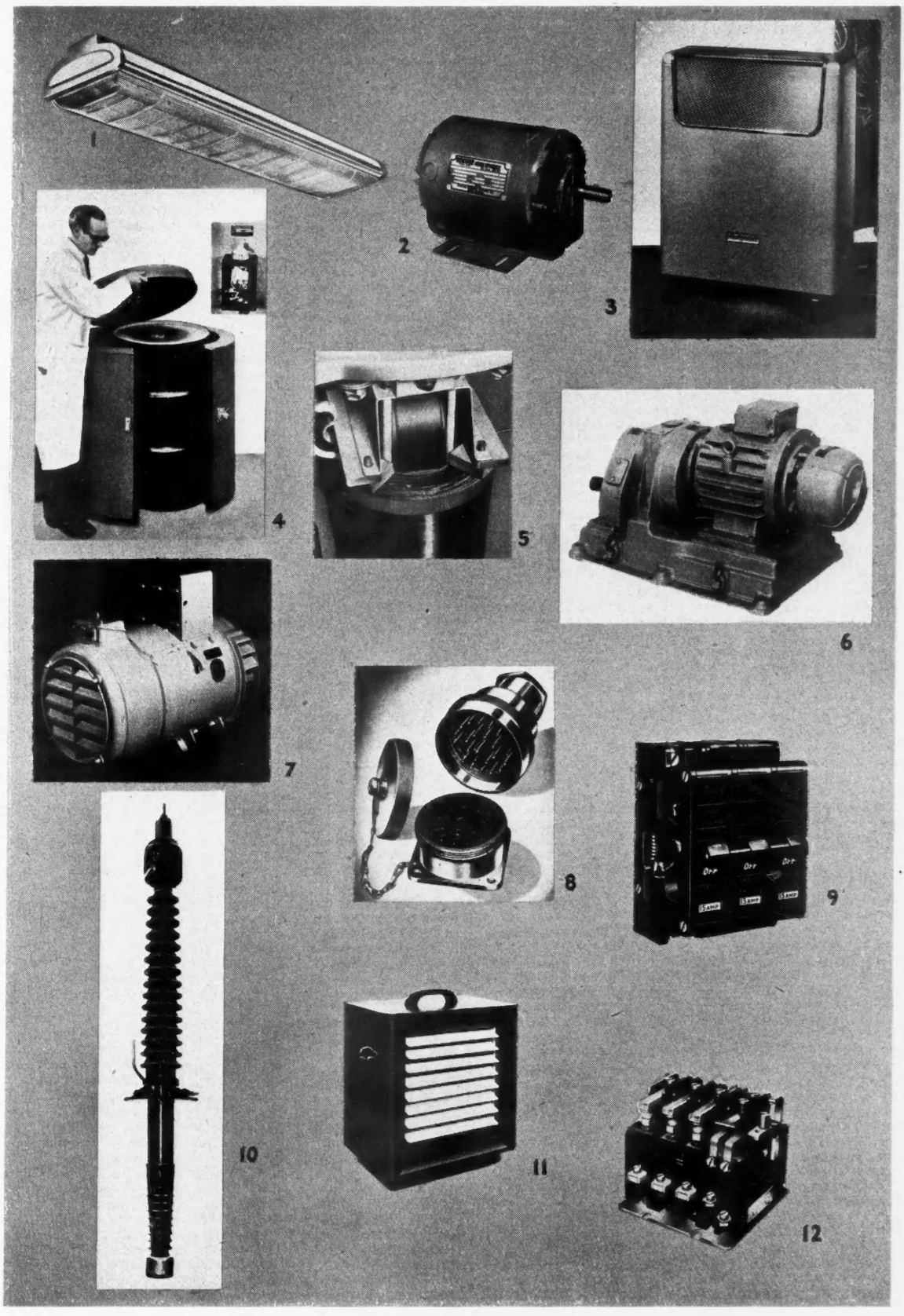
Other machine exhibits include the stock range (1–12 h.p.) of N–S variable speed motors; flameproof motors; a closed-air circuit induction regulator, with heat exchanger, for the control of an N–S variable speed motor of about 150–200 h.p.; a sectioned "Trislot" high torque l.v. squirrel cage motor of small size, and the rotor of a larger "Trislot" motor.

Lewden Metal Products, Ltd., 5, Argall Avenue, Lea Bridge Factory Estate, Leyton, London, E.10.—**Stand F.19.**—In weathertight fittings the range covers switches up to 3-gang, 5 and 15 A sizes, and a series of plugs and sockets in 5, 15 and 30 A sizes. Weathertight cable couplings in all standard gauges, with 3, 4 or 5 pins, and a full range of interlocking and non-interlocking weathertight switchplugs are also displayed. There is a full range of hooks and hook plates, weathertight packing glands, bonding nipples, flexible tubing adaptors, switch units up to 8-gang, 5 and 15 A switchplugs, etc.

Light & Power Accessories Co., Ltd., Wellesley Works, Wellesley Road, Wood Green, London, N.22.—**Stand Q.5.**—Watertight, non-ferrous metalclad, plugs and sockets, switchsockets, switches, etc., of all capacities are displayed. Special self-aligning spring loaded socket tubes giving maximum contact at all times are now incorporated in all the company's ranges. Other exhibits include rubber plugs and sockets, rubber 13 A fused plugs and a display of small multi-pin plugs and sockets for electrical equipment and coaxial cable connectors.

Line Equipment, Ltd., 32, Queen Victoria Street, London, E.C.4.—**Stand S.8.**—Various examples from the company's range of h.v. outdoor switch and fusegear include a 33 kV fault throwing switch with spring operated mechanism and a 33 kV single-break, rotating type switch with "Load-Break" interrupter head. Liquid fuse isolators, expulsion fuse switches, repeater fuse switches and new fibre glass operating poles are also

See opposite page: 1. *A close-ceiling unit from the Holophane "Holoflux" fluorescent range.* **2.** *Hoover Mk IV f.h.p.motor.* **3.** *Hotpoint 2 kW convector heater.* **4.** *Isopad "Isodrum" type IDR/45 heater.* **5.** *Close-up of the coil and windings of a Johnson & Phillips 10 kVA rural distribution transformer.* **6.** *L.D.C. 2 h.p. totally enclosed triple reduction geared motor unit fitted with 6in brake.* **7.** *Arthur Lyon & Co.'s "Newphase" alternator.* **8.** *McGeoch 22-pin 5 A multi-pin socket and plug.* **9.** *M.C.B Co.'s "Lupus" triple-pole miniature circuit-breaker.* **10.** *Micanite & Insulators 220 kV outdoor oil impregnated condenser type transformer bushing.* **11.** *M.E.M. "Rotovair" 2 kW fan heater.* **12.** *M.T.E. Control Gear type UC2 30 A contactor*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shown. Other exhibits are a 33 kV vertical break type switch, fitted with an improved type "B" ice-breaking contact, which incorporates a newly designed over-centre drive, and new type motor or pneumatically operated mechanisms suitable for use with 3-phase isolating switches of any voltage up to 330 kV.

Loblite, Ltd., Third Avenue, Team Valley, Gateshead-on-Tyne, 11.—**Stand T.7.**—On view is the "Lindner" range of porcelain lighting fittings in contemporary styling in which the porcelain and glassware are combined to form new shapes with smooth flowing outlines. Ceiling and wall fittings are available for indoor or outdoor use, farm wiring installations and, in coloured porcelain, for the home.

Londex, Ltd., 207, Anerley Road, London, S.E.20.—**Stand C.4.**—The many different types of electromagnetic relays on view include a new range of very small relays based on the company's LF multiple contact, and LQA mercury switch types. The range of photo-electric control gear has been further extended. Electronic counters are available for speeds up to 4,000 per sec. Working exhibits of the "Lectralevel" floatless liquid level control and the "Fuller" material level switch are also shown.

London Electric Wire Co. & Smiths, Ltd., 24, Queen Anne's Gate, London, S.W.1.—**Stand L.2.**—This company and its associated companies, Frederick Smith & Co., Liverpool Electric Cable Co., Ltd., and Vactite Wire Co., Ltd., are exhibiting a comprehensive range of bare and insulated electrical conductors including "Lewcos" insulated wires and strips; "Anacos" bare copper and alloy rods, wires, strips, strands, sections and forgings; L.E.C. cables and flexibles; resistance wires and tapes in "Vacrom" and "Eureka"; molybdenum rods, wires and tapes.

Long & Crawford, Ltd., Gorton Road, West Gorton, Manchester, 12.—**Stand U.9.**—Outdoor h.v. switchgear shown on this stand includes oil switches to B.S.2631, fuse switches, fuse circuit-breakers, earthing switches, etc. A new introduction is a non-extensible ring main unit which like the oil switches is fitted with independent closing mechanisms in both the on and earth position.

Lord's Controls, Ltd., 15, Victoria Avenue, Camberley, Surrey.—**Stand W.2.**—Automatic control equipment on display includes pump control equipment; mains failure control units; on-demand control units; refrigeration control for diesel mobile cold rooms; flameproof units for oil well equipment; indicator and alarm units; remote control units; and a range of d.c. solenoids.

A.C. Industries, an associated company, is exhibiting transformers and chokes, and saturable reactors.

London Transformer Products, Ltd., Cobbold Estate, Willesden, London, N.W.10.—**Stand K.15.**—Transformer exhibits include power and distribution types; pole mounting units to T.1 specification; industrial transformers for electric furnaces, radar, radio transmission, signal and tunnel lighting units; l.v. transformers; and "C" core and resin cast transformers; earth leakage protection units; metal rectifiers; a Class "H" 500 kVA transformer; and a mining transformer.

Arthur Lyon & Co. (Engineers), Ltd., 6, Carlos Place, Grosvenor Square, London, W.1.—**Stand L.4.**—The "Newphase" alternator, a development from the standard "Stamford" alternator, is shown for the first time. It is a machine having closest regulation for specialised uses, such as telecommunication, electronics, X-ray work, etc. An additional voltage control is incorporated, which converts from a compensated machine to a closed loop system, with a positive voltage reference, against which the output voltage can be compared.

M. & C. Switchgear, Ltd., Kelvinside Works, Kirkintilloch, Glasgow.—**Stand G.18.**—A selection of switch and control gear includes the "Unicube" range of m.v. a.c. group control starter boards; the D431 unit type motor control and distribution gear; oil-break switchgear; a varied selection of pushbutton switches for use with automatic pushbutton starters and control gear and for remote tripping of circuit-breakers; and 100 and 30 A, 660 V flameproof type plugs and sockets certified for Group 11 conditions.

Robert Maclaren & Co., Ltd., Eglinton Works, Kilbirnie Street, Glasgow, C.5.—**Stand F.18.**—Among the range of thermostats and control instruments shown are the Type MB water heating thermostat in which special attention has been paid to electrical clearances to suit Canadian and Continental requirements, and a thermo-time regulator particularly suited to "off-peak" electric heating and process control.

Major Equipment Co., Ltd., 22, Gorst Road, Park Royal, London, N.W.10.—**Stand C.3.**—Cold cathode tubular lighting, "Multi" fluorescent fittings in a range of standard and special designs, and stage lighting equipment.

Mantel Metalworkers, Ltd., 121, Gurney Street, London, S.E.17.—**Stand L.12.**—This company is showing its range of cable trunking including the "Zedlok" and "Springlok" types, an underfloor duct system, and a rising main system using v.i.r. and hard copper risers. Among other products are consumers' supply control units, busbar chambers and adaptable boxes and cases.

Marbourn, Ltd., Roslyn Works, Roslyn Road, London, N.15.—**Stand V.8.**—In addition to a wide range of "Marbo" electrical accessories there is a selection of 5 A plaster-depth flush switch units to which have been added triple and quadruple units.

Marryat & Place, Ltd., P.O. Box No. 55, 50, Hatton Garden, London, E.C.1.—**Stand J.21.**—The "Barduct" 250 A busbar distribution system is displayed. Tapping boxes for the connection of sub-circuits are rated at 20, 30, 60 and 100 A and may be fitted at any of the outlets at 18in intervals. The 75 A "Barduct Minor" is now shown in an improved form. Outlets for tapping boxes are spaced at 12in intervals.

Martindale Electric Co., Ltd., Westmorland Road, London, N.W.9.—**Stand E.12.**—A new marking tool and a range of blowers are shown for the first time. The "Marker" is an improved version of the company's popular "Markit" vibratory marking tool. Balance of the tool has been improved by a partial redistribution of the mechanism within its shockproof, toughened rubber case. Of the four new portable blowers, the "Typhoon," "Cyclone," "Hurricane" and "Tempest," the first is the most powerful model the company has yet marketed. It discharges 83 cu ft/min and has a nozzle velocity of 312 m.p.h.

M.C.B. Co. (Manchester), Ltd., Lupus Works, Oxford Road, Altrincham, Cheshire.—**Stand D.2.**—Exhibits form a comprehensive display of "Lupus" miniature circuit-breakers and M.C.B. distribution gear. The m.c.b.s cover a range from 1·5 to 60 A and are intended essentially for distribution work. A shunt-trip "Lupus" m.c.b., also shown, permits remote tripping of any circuit rated up to 60 A. Any number of such circuits may be tripped from a central point.

William McGeoch & Co., Ltd., 46, Coventry Road, Birmingham, 10.—**Stand M.1.**—New products include a 5 A range of multi-pin plugs and sockets including 8-, 12-, 15- and 22-pin as standards. Terminal connections are by means of sweating buckets to facilitate soldered jointing. Pins and tubes are silver plated and tubes have silver plated beryllium copper clips to ensure sound connections. They have been tested on seven times maximum working load without overheating and flash tested on 3 kV. A special display of indicator light fittings includes several new types, embodying the company's standard features of easy wiring and re-lamping from the front of the panel.

Measuring Instruments (Pullin), Ltd., Winchester Street, Acton, London, W.3.—**Stand J.1.**—An improved type of panel mounting instrument is shown for the first time. Switchboard and portable instruments on show include ammeters, voltmeters, wattmeters, and frequency meters of industrial and precision grades and there are miniature test sets, multi-range ohmmeters and special type decibel meters.

Donvin Instruments, Ltd., an associate company, feature their instrument repair service. A new type of process controller shown is designed to provide an instantaneous reading of temperature, and by means of a pre-set indicator actuate a warning system.

Merlin Mouldings, Ltd., 3, Central Parade, London, S.E.6.—**Stand W.8.**—A new 5ft 80 W fluorescent fitting (F/80) utilises the "Merlin" everlasting resistance ballast and incorporates bi-pin tubes. Other exhibits are a 4ft 40 W fitting (F/40) and the "Simmersafe" kettle element.

Mersey Cable Works, Ltd., Linacre Lane, Bootle, Liverpool, 20.—**Stand F.11.**—Rubber and thermo-plastic insulated wires and cables.

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, 17.—**Stand H.8.**—The company's principal exhibits, mainly of new design or with new features, include several types of electric motors, various items of switchgear and control gear, a model of an on-load transformer tap-changer, and a portable flash-testing equipment. Among control gear exhibits is the "Magistor" photo-transistor relay which has many uses in industry, typical applications being counting, batching, sequence checking, etc.

Metway Electrical Industries, Ltd., Metway Works, Canning Street, Brighton, 7.—**Stand K.13.**—This company is showing all types of industrial and domestic heating elements, wiring accessories and domestic appliances, including electric kettles, irons, bowl fires and reflector fires.

Micanite & Insulators Co., Ltd., Empire Works, Blackhorse Lane, Walthamstow, London, E.17.—**Stand U.7.**—Electrical insulating materials and fabricated parts suitable for practically all types of electrical machinery and equipment from the largest plant to the

smallest component are shown. These include commutator rings, "Paxolin" synthetic resin bonded transformer cylinders, various types of h.v. bushings covering a range up to 400 kV and a display of natural mica, block, splittings and fabricated parts.

Midland Coil Winding Co., Ltd., 4, Lancaster Street, Birmingham, 4.—**Stand K.7.**—Control gear for fluorescent lamps, transformers up to 10 kVA including wall and bench mounting, l.v. transformers for use with portable hand tools and "Midcoil" variable output transformers; and coils of many types which the company winds for the trade.

Midland Electric Manufacturing Co., Ltd., Tyseley, Birmingham, 11.—**Stand D.8.**—The extensive range of l.v. switch and fusegear for lighting and power purposes includes switches for industrial and domestic installations. Among items of particular interest are endurance testing apparatus and machines which demonstrate the features of "Autoline" starters, particularly the functioning of the overload units. New products include an "Autoline" starter "hand-off-auto" switch and a range of "Auto-Memota" starters with sheet steel enclosures. In the appliance section the new "Rotovair" 2 kW fan heater is shown.

Midland Silicones, Ltd., 19, Upper Brook Street, London, W.1.—**Stand C.12.**—British-made silicones in the form of impregnating and coating varnishes, bonding resins, elastomers, compounds and bearing greases are displayed. "MS 5" compound, shown for the first time, has extremely low moisture absorption and consequent retention of electrical properties under humid conditions. Its applications range from filling transistor capsules to coating h.v. insulators to reduce leakage.

M.K. Electric, Ltd., Wakefield Street, Edmonton, London, N.18.—**Stand N.2.**—A large range of electrical wiring accessories for all purposes is on view, in addition to special displays devoted to accessories for domestic installations, industrial work, and public buildings. Attention is drawn to the "Gridswitch" range which has been considerably enlarged. The basic units, all of which are interchangeable, consist of 5 A 1- and 2-way and intermediate switches, 15 A d.p. or s.p. switches, a bell push, a neon unit, a blank unit, and also 5 A 1- and 2-way secret key switches which will be in production later this year.

Miller-Kent Decoratives, Ltd., 56, Half Moon Lane, Herne Hill, London, S.E.24.—**Stand W.7.**—Illuminated flower lights for use as nursery and television lights; larger lighted flowers on festoon cable for outlining features; garlands of lighted flowers, etc., for seaside illumination schemes; natural size flower groups complete, ready to use, in table and wall vases; and a new range of foliage and flowering pot plants.

Monsanto Chemicals, Ltd., 10–18, Victoria Street, London, S.W.1.—**Stand V.4.**—The main products in this company's display are askarel fluids: RD.7051 and "Pyroclor," fire-resistant transformer cooling fluids; and the "Aroclors," capacitor impregnants. Secondary displays include "Lustrex" mouldings and rubber chemicals.

Morphy-Richards, Ltd., 6, Conduit Street, London, W.1.—**Stand E.16.**—New products shown are the "Lincoln" and "Gloucester" chimes, a canister type suction cleaner and an improved model of the company's travel iron. Heaters, hair dryers, toasters, irons, spin dryers and refrigerators complete the display.

M.T.E. Control Gear, Ltd., Leigh-on-Sea, Essex.—**Stand L.21.**—This stand is largely devoted to the introduction of the "Progress" range of unit constructed contactors, relays and other control gear components. This equipment offers advantages in saving in panel space, and is also suitable for building into standard starters and complicated multi-motor control panels. Another new product is the "Multi-Lock" terminal block.

Mycalex & T.I.M., Ltd., Ashcroft Road, Cirencester, Glos.—**Stand T.2.**—Mouldings in "Mycalex" and "Mycalon" materials are shown. "Mycalon" is the more recently developed insulator with improved electrical and thermal qualities at high frequency; the p.f. has been reduced to 0·001 and with a lower permittivity the h.f. loss factor has been halved. A range of T.I.M. f.h.p. shaded pole motors is also shown.

Nalder Bros. & Thompson, Ltd., Dalston Lane Works, London, E.8.—**Stand N.3.**—Instruments shown include ammeters, voltmeters, wattmeters, p.f. meters, frequency meters, reactive meters, kVA meters, vectormeters, synchroscopes, phase rotation indicators, multi-test sets and multi-flag indicators, and also mining flameproof instruments and hermetically sealed instruments. There is a full range of graphic chart recording instruments and a wide selection of relays. An earth proving supply point switch is demonstrated for use with portable electric tools. New products include a derivative relay, a locking indicator, and a mean level indicator with quick setting device.

Nettle Accessories, Ltd., Harper Road, Wythenshawe, Manchester, 22.—**Stand E.6.**—A selection of the company's moulded electrical accessories on display includes 13 A sockets and switchsockets; ceiling roses; e.s. and b.c. batten holders; lampholders; a.c. switches; architectural fittings; and inspection handlamps. There is also a range of cable couplers and rubber-clad sockets and plugs in weatherproof and watertight patterns. Among new 13 A accessories on view are a 3-way fused and shuttered adaptor, a surface socket and switch-socket, and twin-gang flush and semi-sunk switch-sockets.

New Day Electrical Accessories, Ltd., 136–8, Mary Street, Balsall Heath, Birmingham, 12. — **Stand G.5.** — New products include a matched range of wiring accessories, comprising plaster-depth plate switches in 1-, 2- and 3-gang and also architrave patterns; switched and unswitched ring main socket outlets and plugs; multi-gang tumbler switches (5- to 20-gang); and a 20 A d.p. pilot control unit for flush or surface mounting.

Newman Industries, Ltd., Yate, Bristol.—**Stand H.2.**—This company displays one of each frame size available in its ½ to 600 h.p. range of drip-proof motors, and particular emphasis is placed on the new Class "E" insulated drip-proof motors (½ to 50 h.p.) stressing the savings in space, weight and cost. Other exhibits are the new type "JC" totally enclosed double-air-circuit motor in which the cooling efficiency has been nearly doubled; and a new drip-proof vertical hollow shaft motor designed primarily for deep well turbine pump applications.

Nife Batteries, Redditch, Worcs.—**Stand L.22.**—"High performance" cells for diesel engine starting displayed alongside their previous equivalents show the considerable savings in weight, space and cost that have been achieved. A "Neverfayle" hospital type emergency lighting unit is also shown.

Oldham & Son, Ltd., Denton, Manchester.—**Stand K.16.**—Emergency lighting equipment for all applications; battery chargers; traction cells; and portable safety lamps.

Otter Controls, Ltd., Buxton, Derbyshire.—**Stand Q.22.**—Snap action thermostats and circuit-breakers shown include the "Blanketstat" and safety cut-out for electric blankets; the "Tubestat" for domestic immersion heaters; variable thermostat units; manual reset thermal trips; and choke control thermostats and automatic fuses for the motor car industry. The new "Motorguard" for the protection of f.h.p. single-phase motors is also displayed.

Ottermill Switchgear, Ltd., 1, Victoria Street, London, S.W.1.—**Stand H.3.**—Cubicle switchboards, industrial switchboards, oil circuit-breakers, fuse switches, miniature and standard busbar trunking, cable trunking, busbar chambers, h.r.c. fuse units, etc., are shown. There is a complete range of busbar trunking, from 100 to 1,000 A with tapping boxes, incoming cable units, tees, bends, etc., together with a small section of 300 A 4-wire rising main, with fire resisting barrier, expansion joints, and busbar supports.

Panelec (Great Britain), Ltd., 21, Bloomsbury Street, London, W.C.1.—**Stand S.11.**—Exhibits show in model, photographic and diagrammatic form the company's electric low temperature radiant warming equipment and "off-peak" floor warming systems. The embedded floor heating system is also used in a modified form for anti-frost heave mats.

Parmiter, Hope & Sugden, Ltd., Longsight, Manchester, 12.—**Stand E.10.**—The company is showing new ranges of quick-make-and-break heavy-duty combined switches and fuses embodying "Aeroflex" 46 kA fuselinks, and 100 kA 600 V fuses to C.S.A. Code 106, Form 1/13777. Advances have also been made in the design of flush-fronted cubicle type switchboards. Further exhibits comprise power pillars, unit type switchboards, ironclad distribution boards with incoming isolators, cabinet style distribution boards and isolators.

Parnall (Yate), Ltd., 255, North Circular Road, London, N.W.10.—**Stand V.5.**—A comprehensive range of home laundry appliances includes the new "Auto-Dry" tumbler dryer. Designed to fit under the draining board, it has sufficient capacity to deal with a complete load from a medium sized washing machine. Other features are a time switch, which automatically switches off the heating element and stops the drum rotating when the clothes are dry, and a thermal safety cut-out.

Partridge, Wilson & Co., Ltd., Evington Valley Road, Leicester.—**Stand L.5.**—"Davenset" transformer rectifier sets fitted with germanium, silicon and selenium metal rectifier units for various applications requiring bulk supplies of d.c. from a.c. mains are exhibited. Distribution transformers in sizes up to 25 kVA, and a range of oil- and air-cooled transformers are also displayed as well as the "Davenset" automatic cellar draining pump which requires no foundations or elaborate fitting. Transformer rectifiers employing the new junction rectifier cells, silicon and germanium, receive special attention. Among new equipment is a

germanium electro-plating rectifier and an automatic vehicle battery charger.

Oliver Pell Control, Ltd., Cambridge Row, Burrage Road, London, S.E.18.—**Stand C.13.**—In addition to small motors for food mixers and hair dryers and vibrating mechanisms for dry shavers there is a wide range of solenoids. A coil winding demonstration shows coils for the electronics industry being produced at a very high rate by using special machines and coil design techniques.

Permali, Ltd., Bristol Road, Gloucester.—**Stand O.1.**—A cinema occupies a major portion of this stand and various films are shown throughout the day. Insulating material exhibits include arc control pots for oil immersed switchgear; lift rods and guides; stator winding bracing parts and packings; h.v. transformer metallised surve rings and clamping rings; off-load and on-load tap changer components; staywire insulators, etc.

Philips Electrical, Ltd., Century House, Shaftesbury Avenue, London, W.C.2. — **Stand F.10.** — Among recent fluorescent lighting developments shown are a 5ft 80 W reflector lamp, of special interest to engineers with dust problems; an 8ft 125 W lamp; "warm white" de luxe lamps with double coating; and a range of commercial 2ft fittings. The company's continuous trunking fluorescent lighting system, with its many adaptations, is also represented as well as a full range of commercial and industrial fittings for the "Gearless" fluorescent lighting system.

Colour-corrected mercury lamps up to 1,000 W, floodlighting equipment, infra-red lamps, indicating lamps including colour-glow neons, voltage indicators, ultra-violet tubes, and a working model of the K3080 fluorescent starter complete the lighting section.

Among research and control instruments are stepless variable transformers from 260 VA to 2 VA and industrial X-ray equipment.

Philplug Products, Ltd., Lancelot Road, Wembley, Middlesex.—**Stand T.3.**—The recently introduced "Studbolt" is suitable for use in shallow concrete or brickwork where excessive percussion may cause a break-up of masonry.

Pirelli-General Cable Works, Ltd., Southampton. — **Stand Q.2.** — Various designs of power cable joints are shown and demonstrations manifest the ease of application of the company's paper tube principle to cable joints of all designs and voltages up to and including 330 kV.

Poles, Ltd., Tyburn Road, Erdington, Birmingham.—**Stand P.7.**—"Adastra" tubular sectional steel poles for overhead transmission lines, floodlighting towers, street lighting columns, etc., are displayed. The latest addition is the "Rigel" one-piece hexagonal column for Class "B" lighting having a large base compartment for accommodation of auxiliary apparatus.

Porter Electrical Products, Ltd., 2, North Park Road, Harrogate.—**Stand D.1.**—This stand, which concentrates on earthing equipment, shows in addition to "Portaway" earthing conductors a comprehensive range of bonding clamps, and the new "Fulgrip" T.O.C.X. clamp for securing more than one conductor to steel girders. Another exhibit is the company's hole-making punch and "Dyrod" earth electrode in 7, 8 and 10ft lengths.

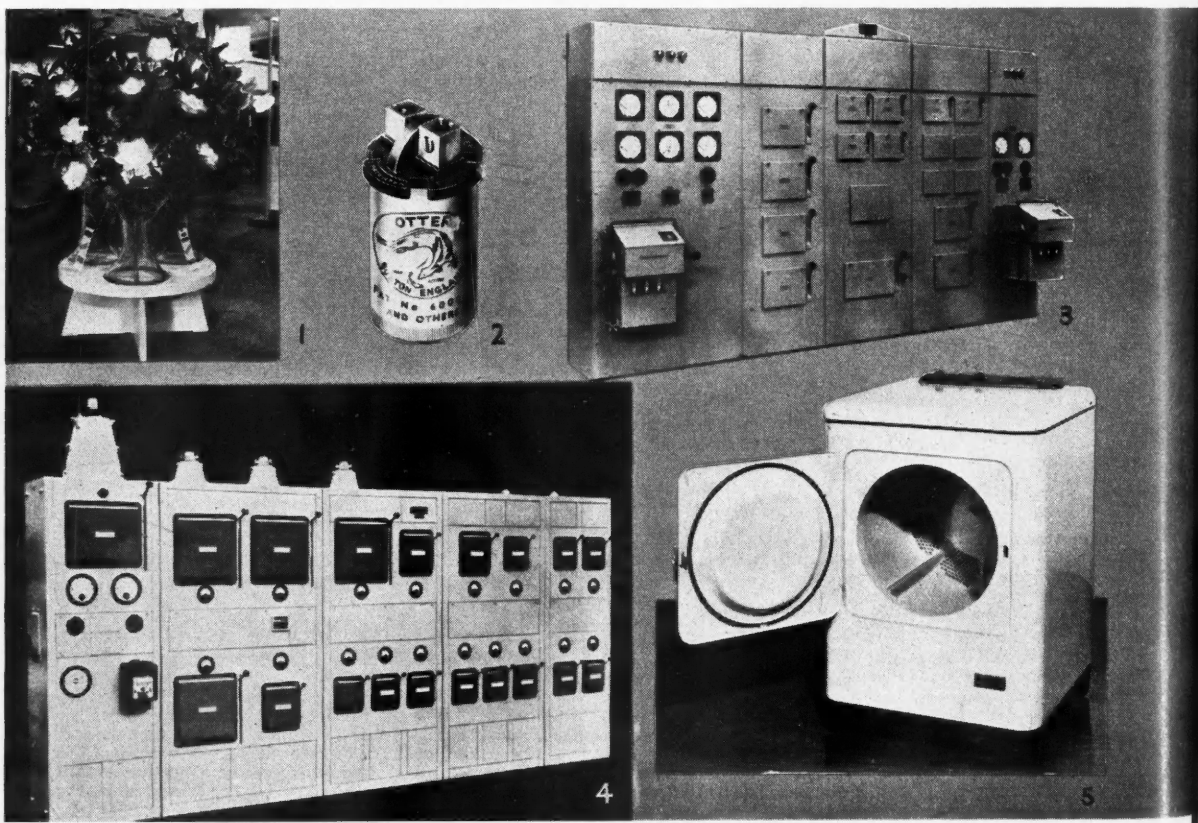
Power Centre Co., Ltd., Lloyd Street, Wednesbury, Staffs.—**Stand L.16.**—Industrial electrical distribution gear displayed comprises busbar trunking, cable trunking, cable-tap system, rising main systems, fuse units, fuseboards, switch-fuses, busbar chambers, switchboards, cable boxes and accessories. Of particular interest is a miniature pattern busbar trunking incorporating all-insulated busbars and tap-off points at 2ft centres.

Power Connectors, Ltd., 2, Caxton Street, London, S.W.1.—**Stand H.13.**—Examples of connectors used in outdoor electrical substations are displayed, together with bi-metal connections and improved types of expansion connectors.

Process Control Gear, Ltd., Lattimore Road, St. Albans, Herts.—**Stand K.1.**—Thermostats of many kinds, including room, domestic, industrial, greenhouse and convector types, are shown. New products include a convector thermostat and a washing machine heater cut-out.

Pyrotenax, Ltd., 7, Victoria Street, London, S.W.1.—**Stand O.5.**—Mineral insulated cables for lighting purposes and for heavy duty applications; cables for 3-phase and single-phase rising mains and laterals for blocks of flats, etc.; pre-assembled cable units; mineral insulated copper covered cables for earthed con-

1. Miller-Kent giant illuminated flower baskets. 2. Otter Controls "Tubestat" for immersion heaters. 3. Ottermill Switchgear cubicle switchboard. 4. Parmiter, Hope & Sugden flush fronted cubicle switchboard. 5. Parnall "Auto-Dry" tumbler dryer



centric wiring; thermo-electric cables; and cables for the radiant heating of buildings, pipe line tracing, de-icing, etc.

Ranton & Co., Ltd., " Rock " Works, Commerce Road, Brentford, Middlesex.—**Stand C.5.**—Electrical accessories and insulating mouldings for all electrical requirements.

Rawlplug Co., Ltd., Rawlplug House, Cromwell Road, London, S.W.7.—**Stand G.4.**—Demonstrations with " Rawlplug " fixing devices and tools are given.

Record Electrical Co., Ltd., Broadheath, Altrincham, Cheshire. — **Stand G.16.**—" Cirscale " instruments are again the major exhibit, and the majority of those seen are Series " P " with platform dials and flat bar pointers. This range includes a redesigned moving-iron instrument which is characterised by high performance and low consumption. A frequency meter in a full range of sizes and scalings is also now available. Graphic recorders, moving-coil relays, portable instruments, insulation and resistance test sets and tachometers are all represented. Among new products are a portable maximum and minimum indicating voltmeter and a spring driven recorder chart mechanism which will run out a 65ft chart without re-winding.

Remploy, Ltd., 25-28, Buckingham Gate, London, S.W.1.—**Stand Q.31.**—Exhibits include a 25 W soldering iron with a light in the handle, and new 65 W and 125 W models; immersion heaters; greenhouse heaters; oil-filled radiators; and a range of " Remploy-Stillman " tubular sheathed elements.

Resinoid & Mica Products, Ltd., Mary Street, Balsall Heath, Birmingham, 12.—**Stand G.5.**—Besides a full range of plastics moulding products, both thermosetting and thermoplastic, there are round and rectangular tubes in resin-impregnated paper and a variety of formings in thermoplastic sheets.

Revo Electric Co., Ltd., Tipton, Staffs. — **Stand G.6.** — The company's " Sol-Etern " lantern has been further developed and two new versions for 5ft and 2ft lamps are on show, as well as a new M.O.T. guard post with fluorescent lamps, and a range of fittings for mercury, sodium, fluorescent and tungsten lamps.

New industrial lighting exhibits include cast iron and die-cast aluminium alloy wellglass units for 40/100 W lamps; a flameproof handlamp; the " Mineway " flameproof fitting for mine roadway lighting; a dust-tight unit for use with 150/200 W tungsten lamps.

The switchgear display includes a selection of the new " Silvertip " 30 A switchfuses and " Safeway " 250 V distribution boards. A selection of ceiling, desk and cabin fans are also shown and among domestic appliances are cookers, irons, convector heaters, wall fires, etc.

A. Reyrolle & Co., Ltd., Hebburn, Co. Durham.—**Stand J.10.**—A new outdoor 200 A 11 kV 75 MVA pole mounted oil-break circuit-breaker designed for H-pole mounting is shown. Its weight operated mechanism provides for three automatic reclosures each with a time delay adjustable between 10 and 60 sec. A lock-out feature prevents the circuit-breaker reclosing if it has tripped within 10 sec of a previous closure.

There is also a new weatherproof extensible circuit-breaker unit which forms part of the " J " range of isolating switches and fuse-switches. This 200 A oil-break circuit-breaker has a breaking capacity rating of 150 MVA at 11 kV, and the unit incorporates a built-in off-load isolator.

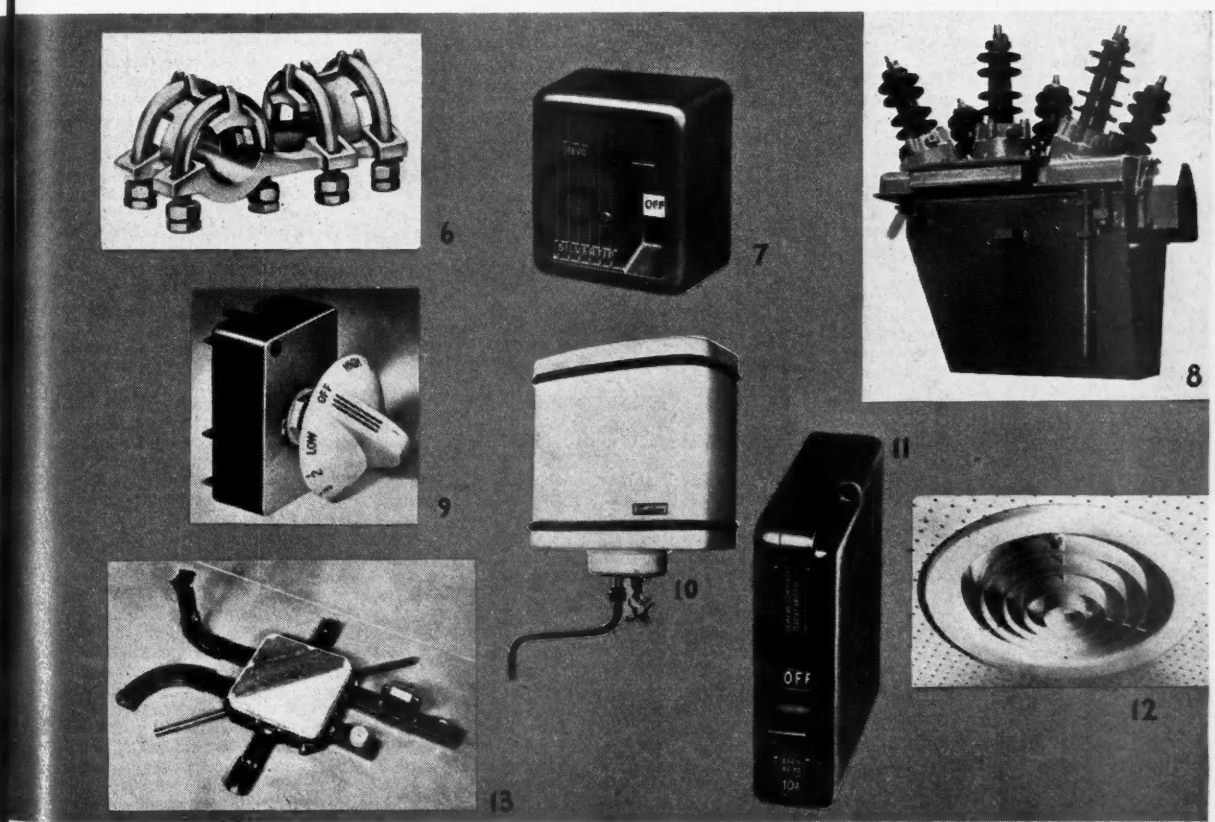
A comprehensive display of cast resin insulated components includes current and voltage transformers, busbars, orifice insulators, etc.

Rheostatic Co., Ltd., Slough, Bucks.—**Stand G.9.**—This company has a new range of "Satchwell" controls for the operation of boiling plates on electric cookers and similar appliances. One type gives smooth and infinitely variable regulation of heat input for single-circuit boiling plates and a divided control for two-circuit boiling plates, while another provides, in addition to infinite regulation, an initial boost to bring the boiling plate quickly up to maximum temperature to ensure rapid boiling. Also of interest to the cooker industry is the new " TC " oven thermostat.

A range of " Satchwell " thermostats, together with a representative selection of automatic temperature controls, completes the display.

Richard Johnson & Nephew, Ltd., Forge Lane, Manchester, 11.—**Stand K.12.**—Wires for the electrical trades include steel and copper wires and strand;

6. Power Connectors "Dubic" tee connector. 7. Revo 30 A "Silvertip" switchfuse. 8. Reyrolle Type J.8 200 A 11 kV oil-break circuit-breaker. 9. "Satchwell" boiling plate control (Rheostatic Co., Ltd.). 10. Santon FB.2 thermal storage water heater. 11. Siemens-Schuckert Type S.141 miniature circuit-breaker. 12. S.L.R. Electric Type L/RR23 recessed reflector. 13. Simplex under-floor duct system



steel cored aluminium; and other composite conductors and copper strip.

Rotaflex (Great Britain), Ltd., 4–10, Nile Street, London, N.1.—**Stand Q.20.**—A new range of "Rotaflex" and "Geni" lighting fittings is displayed.

Rowlands Electrical Accessories, Ltd., R.E.A.L. Works, Hockley Hill, Birmingham, 18.—**Stand J.17.**—A comprehensive display of all types of industrial and commercial lighting fittings includes floodlanterns; "Reflectortight" non-corrodible lighting units; and "Realite" mirror-lined reflectors.

Runbaken Electrical Products, 45, Oxford Road, Manchester, 1.—**Stand S.6.**—A new loop tester is shown in addition to flash and insulation testers, earth analysers, armature and stator testers, soldering equipment, rectifiers and battery chargers.

Wm. Sanders & Co. (Wednesbury), Ltd., Falcon Electrical Works, Wednesbury.—**Stand E.2.**—A range of fuseboards, fuse switches and switchfuses includes the company's latest "Sandaline" surface mounting distribution fuseboard. There are also cubicle and unit construction switchboards, and a complete range of domestic control equipment and accessories.

Sangamo Weston, Ltd., Great Cambridge Road, Enfield, Middlesex.—**Stand N.1.**—Electricity meters, metering accessories, time switches and electrical measuring instruments, photo-electric cells, instrument switches, moving coil relays, tachometers, thermometer bulbs, etc., are included in this company's display and there is a range of model S110 platinum resistance bulbs normally used in conjunction with a "Ratiometer" indicator for temperature measurement.

Joseph Sankey & Sons, Ltd., 168, Regent Street, London, W.1.—**Stand F.7.**—Laminations made from electrical quality steel include representative samples suitable for motors, generators, transformers, etc. Welded and riveted stator and field cores, and aluminium diecast rotors are also shown. Attention is drawn to a new insulation the company has adopted for laminations which is capable of withstanding annealing temperatures, repels water and has the same insulating properties as those of "Insuline."

Santon, Ltd., Somerton Works, Newport, Mon.—**Stand E.3.**—The new F.B.2 thermal storage sink type water heater is shown with a choice of six changeable coloured bands allowing the heater to meet variations in colour schemes. A new design of automatic electric flow heater, Type QF, has been produced for such purposes as augmenting or replacing solid fuel boilers and for central heating generally in churches, factories, etc. A single-deck unit can have loadings from 12 to 63 kW or two units can be coupled to accommodate a loading up to 126 kW.

There is also a new clamp-on thermostat designed to control non-thermostatic hand switched immersion heaters, and other exhibits include industrial and domestic heaters, elements, rotary switches, control units, contactors and relays, etc.

Scottish Cables, Ltd., Deanside, Renfrew, Scotland.—**Stand J.24.**—Exhibits range from large power cables to cables and flexibles for domestic installation.

Sealed Motor Construction Co., Ltd., Bristol Road, Bridgwater, Somerset.—**Stand Q.25.**—A new "Lagoon" self-priming electrically driven pump (Type M2MP 100); a hot water circulating pump (model H.C.150); and a range of 4, 6 and 8in "Amphibia" submersible pumps.

Siemens-Ediswan Organisation, 38–39, Upper Thames Street, London, E.C.4.—**Stand G.11.**—On this stand are shown l.v. switchgear, telephone equipment, cables, wiring accessories, valves, transistors, electro-medical equipment, electronic indicators, lamps and lighting fittings. Among new products are the "Intermatic," a telephone instrument combining "intercom" and automatic facilities; a sodium lamp street lighting unit; and contemporary domestic and commercial fluorescent lighting fittings.

A complete range of hermetically sealed transistors for h.f., l.f. and i.f. applications is also exhibited, and a selection of industrial valves includes vapour cooled and radiation cooled types. Space heating equipment on show includes tubular and wafer convector heaters.

Siemens-Schuckert (Great Britain), Ltd., Great West Road, Brentford, Middlesex.—**Stand M.4.**—The company's switchgear section includes a display of S.141 plug-in type miniature circuit-breakers (maximum 30 A), together with a new range of distribution boxes developed to accommodate the units. Various types of flameproof equipment from small push-buttons and limit switches to motor control panels of the boltless type are on show, while the furnace range includes a general purpose bench unit, laboratory "Silit" tube furnace and portable welding electrode pre-heating oven.

Simplex Electric Co., Ltd., Broadwell, Oldbury, Birmingham.—**Stand F.11.**—The main feature of the switchgear display is a 24ft curved switchboard built up from representative items from the range of "Regent" busbar chambers (350, 550 and 800 A), switch fuses (15, 30, 60 and 100 A), switches (15, 30 and 60 A), distribution boards (15 and 30 A), changeover switches (15, 30, 60 and 100 A) and "Monarch" fused switches (150 to 300 A).

Examples of the company's flameproof equipment consist of conduit fittings, switch plugs, handlamps, distribution boards, and lighting fittings, including fluorescent. Lighting fittings include weatherproof and dust-tight bulkhead fittings; two ranges of wellglass lanterns (60 and 100 W); and anti-corrosive fluorescent fittings. General purpose, medium range, and weatherproof floodlight projectors are also shown.

The range of "Creda" domestic products includes the new "Debonair" spin dryer, and a range of space heaters and radiant fires.

Slough Metals, Ltd., Oxford Avenue, Trading Estate, Slough, Bucks.—**Stand A.10.**—Non-ferrous sand and die castings, with particular emphasis on those used in the electronic, lighting, electrical and instrument industries.

S.L.R. Electric, Ltd., Welbeck Works, Welbeck Road, South Harrow, Middlesex.—**Stand Q.6.**—On this stand are shown additions to the company's range of "Module" lighting fittings, especially those designed to illuminate the ceiling; new designs in "Perspex" diffusers; contemporary pendant and ceiling fittings; and examples of school lighting units.

Small Electric Motors, Ltd., Churchfields Road, Beckenham, Kent.—**Stand L.8.**—The S.E.M. commutator lathe is demonstrated on this stand. With it, it is claimed, large scale production of commutator motors is now possible using unskilled labour. Consistent accuracy in operation enables a limit of 0·0001in on diameter and 0·0001in on concentricity to be maintained.

Smith Hobson, Ltd., Hersham, Walton-on-Thames, Surrey.—**Stand Q.16.**—A representative range of metering current transformers in various ring and wound primary types, open and enclosed patterns, is shown. Of particular interest are the "ammeter transformers." These are ring types with a ratio error limit of 1 per cent of full scale over the working range, suitable for use with industrial grade ammeters without calibration.

Smith Meters, Ltd., Rowan Road, Streatham Vale, London, S.W.16.—**Stand W.1.**—The range of house service meters includes single-phase credit and prepayment types, polyphase meters of all sizes with and without maximum demand indicators, and meter test sets. During the past year the company has developed the "Sincos" kVA meter designed to register kVA irrespective of p.f.

Herman Smith Smithlite, Ltd., Empire Works, Dudley, Worcs.—**Stand R.2.**—Among the lighting fittings displayed is a new range of decorative fluorescent fittings utilising the "Smithlite" centre-contact lamp. They are of contemporary design, in various colours and finishes. Vitreous enamelled trough fittings, and trough and batten fittings in 10ft lengths designed to accommodate two single 5ft lamps end to end are also on view.

Smiths Clocks & Watches, Ltd., Waterloo Road, Cricklewood, London, N.W.2.—**Stand G.14.**—In addition to "Sectric" clocks for the home, the company shows time clocks for radio and television, time switches for cookers, washing machines, etc., and electric motors for signs. English Clock Systems display their range of master clocks and slave clocks, together with time recorders, watchman's clocks, industrial timers, etc.

Smiths Industrial Instruments, Ltd., Chronos Works, North Circular Road, London, N.W.2.—**Stand Q.17.**—A new type of ±1 per cent calibrated relay for the control of voltage, current or speed is displayed. Precision is achieved by a patent magnetic lock which can be adjusted accurately to a predetermined value. Other exhibits are magnetic, hand and electric tachometers, the heavy-duty "Desynn" system of remote indication with flameproof cases, recorders, etc.

South Wales Switchgear, Ltd., Blackwood, Monmouthshire.—**Stand J.18.**—Switchgear exhibits include a 33 kV, outdoor type, oil circuit-breaker for 1,000 MVA service; an 11 kV air insulated, outdoor, metalclad unit fitted with 250 MVA oil circuit-breaker and panel mounted relays and instruments; a 4-panel control and relay board; a 2-panel, 11 kV air insulated, indoor, metalclad display switchboard; and a l.v. switchfuse board from the "T" range fitted with 60, 300 and 800 A switches.

Square D, Ltd., 100, Aldersgate Street, London, E.C.1.—**Stand U.8.**—New equipment and a widening of their existing range of electrical control gear are the main features of this company's stand. Exhibits include star-delta starters; combination starters; a.c. mechanically held relays; magnetic contactors; and reversing contactors. Much of the equipment first introduced and exhibited last year has been extended in range to give even greater flexibility of application. There are also test units which show examples of Square D equipment actually in operation, and a display panel which demonstrates pneumatic timing relays.

J. G. Statter & Co., Ltd., 82, Victoria Street, London, S.W.1.—**Stand J.20.**—Among new products are an 11 kV outdoor metalclad oil circuit-breaker equipment of the drop-down, draw-out type designed for outdoor installation; and a new smaller frame size of l.v. a.c. air circuit-breaker rated up to 600 A.

Standard Telephones & Cables, Ltd., Connaught House, Aldwych, London, W.C.2.—**Stand H.7.**—A representative selection of power transformers covering single- and three-phase types includes open, potted, C-core and hermetically sealed construction. "SenTerCet" silicon rectifier transformer equipment is shown operating on a 415 V 50 c/s three-phase input to give an output of 400 V at 15 A.

Other exhibits include industrial charging equipment; Type "DR" and "ATR" rectifier equipments; cathodic protection rectifier equipments; remote control equipment; p.f. capacitors; power and communication cables; magnetic materials; thermionic valves, etc.

Sterdy Telephones, Ltd., 180, Tottenham Court Road, London, W.1.—**Stand Q.32.**—Intercommunicating telephones; staff location systems; electric locks; lamp signalling relay units; junction boxes; door indicators; alarm pulls; and bells.

Sterling Cable Co., Ltd., Aldermaston, Berkshire.—**Stand Q.18.**—New products include h.v. plastic insulated cables for power supply.

Stream-Line Filters, Ltd., Ingate Place, London, S.W.8.—**Stand Q.34.**—Filters specially designed for the removal of moisture, sludge and other solid impurities from oil-immersed circuit-breakers, transformers, etc., are shown, and there are mobile trailer mounted filter plants.

Sumo Pumps, Ltd., Gatwick Road, Crawley.—**Stand Q.19.**—The company is demonstrating its new heavy duty submersible drainage pump designed to handle a high proportion of solids. A special starter, with portable stand, is also shown.

Sunvic Controls, Ltd., 10, Essex Street, Strand, London, W.C.2.—**Stand D.6.**—Industrial control equipment includes energy regulators, H.V.S. tubes and relays, time delay switches, and adjustable bi-metal and glass-sealed thermostats. Single and multi-point high-speed chart recorders are demonstrated and plug-in range-change bobbins are shown. The company also shows water heater, oven and convector heater thermostats and the "Simmerstat" regulator.

Switchgear & Cowans, Ltd., Elsinore Road, Old Trafford, Manchester, 16.—**Stand Q.39.**—Switchgear exhibits include a scale model of a Type "K.1" 33 kV 1,000 MVA outdoor oil circuit-breaker; a Type "K.5" outdoor triple-pole hand-operated air break isolator for 33 kV service; and Type "K.11" 25 kV 300 MVA single-phase switchgear, incorporating an oil circuit-breaker and two oil isolators. Other exhibits are a Type "RAO" outdoor ring main unit comprising two 400 A fault making oil switches and 150 MVA oil circuit-breaker for 6·6 kV or 11 kV service; "L" type double tier air insulated switchgear incorporating horizontally withdrawable air circuit-breakers with breaking capacities up to 45 MVA at 600 V; a Type "L2W" triple pole, hand operated, wall mounting 800/1,000 A air circuit-breaker; a Type "MRS" flameproof section switch; Type "UB.4" vertical isolation, air insulated 500 MVA switchgear for 6·6 kV or 11 kV; and a Type "A71"/"ID" metalclad compound-filled switchboard.

H. D. Symons & Co., Ltd., Park Works, Kingston Hill, Surrey.—**Stand K.17.**—New materials are Class "E" "Symax" laminates, comprising triacetate and alternatively "Melinex" films bonded to "Elephantide" or "Leatheroid," and Class "H" pressure sensitive silicone "Elastomer" impregnated glass tape and a semi-cured unsupported silicone "Elastomer" tape.

Synchronome Co., Ltd., Abbey Electric Clock Works, Woodside Place, Alperton, Middlesex.—**Stand L.14.**—Master clocks, electric wall clocks, time recorders, special timing and control apparatus, etc.

Synthetic Carbon & Engineering Co., Ltd., Cumberland Road, Stanmore, Middlesex.—**Stand D.4.**—The display includes carbon brushes of all kinds, shapes, grades and fittings, brush holders in all forms, copper gauze and laminated brushes, contact parts, controller fingers, contact tips in silver and copper, etc. Examples of traction brush holders and traction switchgear components are also shown.

Tate Bros., Ltd., Portslade, Sussex.—**Stand Q.29.**—The latest addition to the company's range of jointing compressors, the "Autopressor," shown in prototype form, accommodates dies for the full range of conductors. Other products are the new "Tate Minor," a 17-ton compressor for jointing conductor from 0·025 copper equivalent to 0·075; the "Minipressor" hydraulic compressor; compression fittings for steel cored aluminium, aluminium alloy, copper and steel conductors; and a bi-metal fitting for stranded conductors.

George E. Taylor & Co. (London), Ltd., 34, Southwark Bridge Road, London, S.E.1.—**Stand O.3.**—This company, as electrical engineers and contractors, display photographs of typical installations together with examples of workmanship.

Taylor, Tunnicliff & Co., Ltd., 125, High Holborn, London, W.C.1.—**Stand W.6.**—Products on display include h.v. bushing and transmission line insulators for voltages up to 275 kV, ceramics for electrical accessories and appliances, and electronic components.

Telegraph Construction & Maintenance Co., Ltd., Mercury House, Theobald's Road, London, W.C.1.—**Stand G.10.**—The Cables Division is showing the latest developments in polythene insulated h.v. power cables, including an experimental installation of 100 kV d.c. single-core, submarine type cable. The standard range of "Telcon" p.i. cables for voltages up to 33 kV with copper or aluminium conductors and lead or aluminium sheaths is also displayed.

The Metals Group's exhibits include magnetic materials, thermostatic bi-metals for domestic appliances, switchgear and motor overload protection, etc.

Transformer and choke laminations are shown by an associated company, Magnetic & Electrical Alloys, Ltd.

Tetra Engineering Co., Ltd., 1–3, Redhill Street, London, N.W.1.—**Stand G.19.**—Tubular sheathed, mineral embedded elements for domestic and industrial appliances.

Thermodare (Great Britain), 94/98, Petty France, London, S.W.1.—**Stand G.1.**—On show for the first time is the company's new contemporary design off-peak night storage heater with exclusive protective thermal link.

Bertram Thomas (Engineers), Ltd., Worsley Street, Hulme, Manchester, 15.—**Stand D.10.**—The company introduces its new range of 440/660 V a.c. metalclad air-break distribution switchgear. Single and double tier arrangements, with horizontal draw-out type air break circuit-breakers, are on view. Other exhibits comprise a large selection of d.c. high speed circuit-breakers for all voltage ranges up to 3,000 V; heavy duty semi-high speed circuit-breakers; tubular heaters, etc.

Thorn Electrical Industries, Ltd., 233, Shaftesbury Avenue, London, W.C.2.—**Stand D.9.**—Special displays demonstrate "Atlas Atlantic," a new range of 366 fluorescent fittings, while other sections draw attention to Atlas "Silverlight," "Softlight" and projector lamps, fluorescent tubes and the "Kitchenlight" fluorescent fitting.

The display of Tricity Cookers, Ltd., includes the new "Viscount" model.

F. W. Thorpe, Ltd., Thorlux Works, Welby Road, Hall Green, Birmingham, 28.—**Stand F.2.**—A complete range of industrial lighting equipment reflectors for use with tungsten, mercury discharge, mercury discharge fluorescent and hot cathode fluorescent lamps, including a 8ft 125 W fluorescent trough, is shown. Among new products are three-duct "Slydalong" trunking designed to carry h.v. and l.v. cables; "Overlamp" dispersive reflectors with apertures for upward illumination; and a junior "Adjustaflood" for 200/300 W lamps.

T.M.C. Harwell (Sales), Ltd., 37, Upper Berkeley Street, London, W.1.—**Stand K.5.**—"Temco" wiring accessories include 5, 13 and 15 A switched socket outlets; shuttered 5 and 15 A switchsockets; and a 13 A range with large size terminals.

Troughton & Young, Ltd., Basil Street, Knightsbridge, London, S.W.3.—**Stand H.4.**—A new series of lighting fittings, the "Harlequin," based on a black and white colour scheme, is displayed as well as many new designs from the range of "Mondolite," "Versalite" and "Ultralux" lighting fittings. Electric heating equipment is shown by Tyrad Electric, Ltd., an associated company, in the form of storage space heaters, high temperature radiant panels, tubular heaters and a floor heating system.

Tudor Accumulator Co., Ltd., 137, Victoria Street, London, S.W.1.—**Stand J.3.**—On this stand there is a large stationary cell, typical of the heavy-duty batteries supplied by the company for power station use. Emergency lighting equipment includes a self-contained "Safetylyte" set.

Tufnol, Ltd., Perry Barr, Birmingham, 22B.—**Stand K.11.**—Equipment made from "Tufnol" is now being used on pipelines principally to counteract electrolytic action, and examples on show include bearing pads such as those used in the North of Scotland hydro-electric schemes. Gaskets, washers and bolt-jackets for insulating pipeline couplings in the Middle East are also shown. Other exhibits include moulded bell, ball and barrel insulators available for working loads of up to 2 tons and 660 V working pressure; fish-plate insulators; a multi-way terminal board; and a variety of intricate punchings.

Turners Asbestos Cement Co., Ltd., Trafford Park, Manchester, 17.—**Stand K.2.**—The products in this display include ebony grade "Sindanyo" electrical insulation boards for panel and switchboard use, natural grade "Sindanyo" arc and heat resisting boards showing the use of the material in air circuit-breaker arc chutes and core drying plates for foundry

use, etc., asbestos paper, paper tape, paper tubes and moulded paper sections. "Siluminite" phenolic and melamine resin bonded products are also shown and special attention has been paid to the development of asbestos based Class "H" materials.

Uni-Tubes, Ltd., 9, South Molton Street, London, W.1.—**Stand A.12.**—"Kopex" pliable electrical conduit which can be set, bent and cut by hand is composed of layers of continuous metal and paper strip; produced in continuous lengths, or minimum 100ft coils in standard electrical sizes from ½ to 2·9in o.d. It is also available with p.v.c. outer covering to give protection against corrosive attack.

Varilectric, Ltd., 10, Melon Road, Peckham, London, S.E.15.—**Stand H.11.**—Switchboard exhibits include a radial edged cubicle pattern switchboard; a temporary site services portable switchboard incorporating plug-in type fused switches; and a multi-tier motor starter panel, incorporating combined fused switch motor starter units. Examples of the company's rising main busbars, overhead busbars with tap off units, distribution fuseboards, and "clear run" cable trunking, are also shown.

Veritys, Ltd., Brettenham House, Lancaster Place, Strand, London, W.C.2.—**Stand Q.8.**—"Maxlume" products of interest to the lighting industry include a "Permaseal" unit, particularly suitable for chemical works, power stations, etc.; "Stayclean" fittings for areas where the atmosphere is very dirty though dry; flameproof equipment; general industrial fittings; angle floodlights; and commercial fittings.

Victor Products (Wallsend), Ltd., Wallsend-on-Tyne, Northumberland.—**Stand P.5.**—Weatherproof/flameproof lighting fittings and equipment include two new items, a small malleable iron junction box and a large aluminium alloy junction box. To meet conditions outside flameproof areas the company now offers a non-flameproof/weatherproof/dustproof fitting in 100 and 200 W sizes.

Volex Electrical Products, Ltd., Salford, 6.—**Stand F.15.**—Wiring accessories, including lampholders, ceiling roses, junction boxes, sockets and plugs, etc.; l.v. terminal units; plaster depth 1–4 gang 5 A switches, 13 A switchsocket outlets and single and twin socket outlets; cables and flexibles; and plastic shades.

W. G. Walker & Co. (Engineers), Ltd., Emery Hill Street, London, S.W.1.—**Stand G.20.**—"Mainstay" cable trunking and accessories; busbar chambers; underfloor trunking and boxes; overhead busbar systems; and paddle type fan brake dynamometers.

Wallacetown Engineering Co., Ltd., Viewfield Road, Ayr.—**Stand Q.14.**—A selection from the company's "Wecol" range of industrial air-break switch and control gear, for use on m.v. systems, is shown. Apart from distribution or group motor control boards, pillar type units are available for individual application and one of these is on show along with two composite switchboards. There is also a selection of the Buxton certified range, including the latest type of N.C.B. standard gate end switch unit, drill control panel and lighting transformer, the latter two units being exhibited for the first time.

Walsall Conduits, Ltd., Excelsior Works, West Bromwich.—**Stand G.13.**—Steel conduit and conduit fittings with accessories are shown. New products include a midget switch and pilot light; illuminated pushbutton switch; illuminated switching point; thermal changeover switching unit; outlets for underfloor duct systems; flameproof pygmy switchfuse; and a new and attractive finish on the "Walglow" range of tubular heaters.

Wandleside Cable Works, Ltd., 106, Garratt Lane, London, S.W.18.—**Stand W.9.**—In addition to a complete range of v.i.r., t.r.s., p.v.c., silk and cotton braided, asbestos, lead, p.b.j., h.s.o.s. and welding cables, the company shows house wiring and overhead cables with aluminium conductors. "Corrusteel" armoured cables for street lighting and underground wiring, and the new "Florawarm" floor heating cables are also shown.

Wandsworth Electrical Manufacturing Co., Ltd., 136, Cromwell Road, Kensington, London, S.W.7.—**Stand C.6.**—A large range of electrical accessories, particularly for hospitals, schools, public buildings, etc., includes mercury sparkless switches, switchplugs and special units for operating theatres, and bed-side units. New items include a range of neon pilot light units; iron-clad industrial switches and switchplugs; adjustable phased units; and 30 A interlocked mercury sparkless switchplugs for mobile X-ray units.

Watford Electric & Manufacturing Co., Ltd., Victoria Street, London, S.W.1.—**Stand G.17.**—A representative range of automatic air-break control gear is exhibited, including high performance contactors, individual starters, control panels and starter switchboards. An example of the company's resistance thermometry temperature control equipment with auxiliaries is also to be seen, and a 3·3 kV air-break contactor starter suitable for direct switching motors up to 1,000 h.p. is shown for the first time.

Watliff Co., Ltd., Lombard Road, Morden Road, London, S.W.19.—**Stand L.11.**—Commutators and sliprings of built-up and moulded construction range from the smallest to those required for the largest motors and generators. Many have been specially designed to operate at high speeds and to withstand a wide range of temperatures.

Weir Electrical Instrument Co., Ltd., Bradford-on-Avon, Wilts.—**Stand D.11.**—Electrical indicating instruments in a wide range of sizes and patterns are shown.

Westinghouse Brake & Signal Co., Ltd., 82, York Way, King's Cross, London, N.1.—**Stand J.13.**—New ranges of germanium rectifier equipments are displayed. These include sets with heavy current outputs suitable for electrochemical and electro-deposition processes, battery chargers, and equipments with outputs suitable for d.c. power supplies.

New developments of the "Westalite" ranges of selenium rectifiers are also shown, including direct water-cooled heavy current "Wesculite" rectifiers for electro-plating, battery chargers, new "Westat" constant d.c. voltage rectifiers, cathode protection rectifier sets and cinema arc rectifiers.

Westwood Switchgear, Ltd., 22, Gorst Road, Park Royal, London, N.W.10.—**Stand C.3.**—Unit assembly switchboards, component and change-over switches, and knife switches, ranging from 30 to 2,000 A.

William White (Switchgear), Ltd., 368, Coldharbour Lane, London, S.W.9.—**Stand D.12.**—Switchgear exhibits include new motor operated remote controlled change-over switches, 450 A 3-phase, 440 V, with full interlock system.

Whipp & Bourne, Ltd., Switchgear Works, Castleton, Rochdale, Lancs.—**Stand K.3.**—The company's a.c. industrial type switchboard is suitable for working on a 450 V three-phase 50 c/s system, and is equipped with withdrawable pattern a.c. air-break circuit-breakers up to 1,600 A capacity. A.c. circuit-breakers and a d.c. deadfront switchboard, equipped with withdrawable d.c. circuit-breakers, are also exhibited.

Henry Wiggin & Co., Ltd., Wiggin Street, Birmingham, 16.—**Stand E.15.**—Examples are shown of heating equipment for domestic and industrial use employing "Brightray" nickel-chromium electrical resistance materials. "Ferry" nickel-copper alloy with a constant resistance over a range of temperature is shown in the form of control resistances, circuit-breakers, etc. Other exhibits illustrate the use of the "Nilo" controlled expansion alloys for thermostats and glass-to-metal seals.

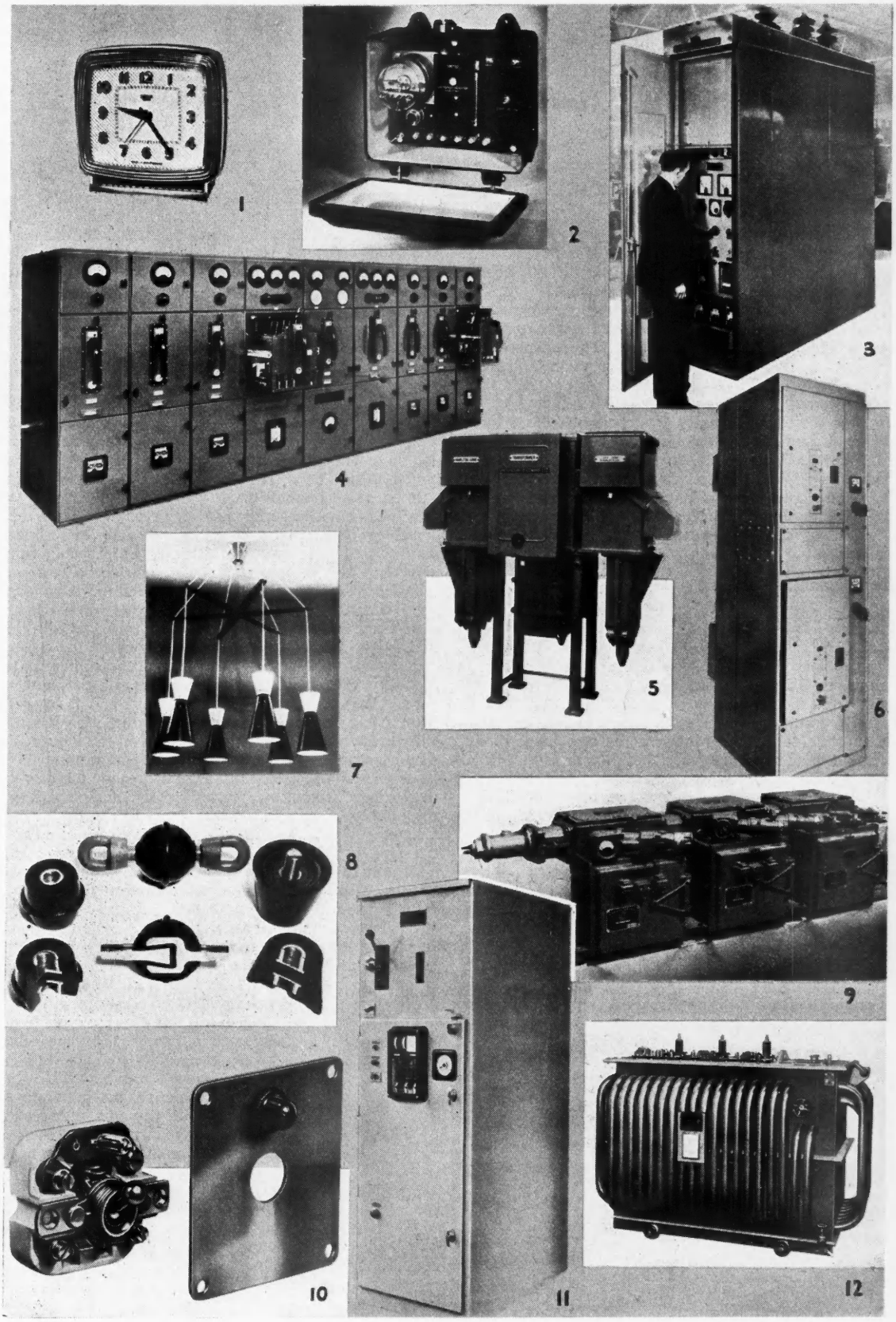
Edward Wilcox & Co., Ltd., Sharston Road, Wythenshawe, Manchester.—**Stand S.3.**—The new "K" type fuse holder and base suitable for use with B.S.646 cartridge fuses is shown. In addition, there is a range of "Slydlok" vibration-proof fuses and associated equipment ranging from 5 to 100 A. This includes the "X" and "G" types and the recently introduced "H" type fuse available for 5, 15 and 30 A with neon indicators. A further display consists of fuse-switch panels.

Woden Transformer Co., Ltd., Moxley Road, Bilston, Staffs.—**Stand O.7.**—Complete transformers and interiors of rural type pole mounting and distribution units; auto transformers and reactors for electric furnaces; and a 270 kVA r.f. heating unit are shown.

Yorkshire Copper Works, Ltd., Leeds.—**Stand D.5.**—"Yorcalbro" (aluminium-brass), "Yorcoron" and other "Yorkshire" tubes for condensers and other heat exchange equipment, including oil and air coolers, feed water heaters, evaporators, etc.

Yorkshire Switchgear & Engineering Co., Ltd., Meanwood, Leeds, 6.—**Stand A.9.**—Examples of the company's "IVI" range of e.h.v. metalclad switchgear, and "Y" switch-fuse and motor control gear are shown. The main feature of the display is a demonstration of the recently introduced S.A.M. (spring assisted manual) operating mechanism associated with a Type "IVIO–13" oil circuit-breaker unit.

See opposite page: **1.** *Smiths "Autoglow" "Sectric" floodlit alarm clock.* **2.** *Smiths Industrial Instruments overspeed control unit showing sealed calibrated relay on the left.* **3.** *Control panel side of an 11 kV outdoor metalclad unit (South Wales Switchgear).* **4.** *9-panel switchboard equipped with Statter h.r.c. draw-out air circuit-breakers.* **5.** *Switchgear & Cowans type "RAO" outdoor ring main unit.* **6.** *Bertram Thomas 440/660 V distribution unit.* **7.** *One of the Troughton & Young "Harlequin" series lighting fittings.* **8.** *Tufnol moulded bell, ball and barrel insulators.* **9.** *Wallacetown Engineering Co.'s 3-panel flameproof switchboard incorporating a gate-end switch, drill control unit and lighting transformer.* **10.** *Walsall midget switch and pilot light.* **11.** *Watford 3·3 kV air-break contactor starter in cubicle.* **12.** *Woden 270 kVA r.f. heating unit transformer*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INTERNATIONAL INSTRUMENT SHOW

American and Continental Designs

THE Third International Instrument Show was held from 25th March to 29th March in the Caxton Hall. Covering the same period as the Physical Society Exhibition, this enterprise by B. & K. Laboratories, Ltd., offered an opportunity to compare instruments and equipment from the Continent and the United States.

There were, in fact, several British instrument manufacturers represented at the Show, but interest naturally centred on the exhibits from overseas. They ranged from very small components and ranges of junction transistors and diodes to a large oil-cooled vibration exciter. This permits vibration testing of specimens weighing up to 250 lb at frequencies from 5 c/s to 2 kc/s with a force of 3,500 lb, and can be operated in environment chambers within the temperature range −100 deg F to 300 deg F, under high vacuum or at relative humidities up to 95 per cent. The equipment is one of a wide range which extends from capacity and frequency ranges of 1·2 lb and 20 c/s to 10 kc/s, respectively, to 12,500 lb and 2 c/s to 2 kc/s.

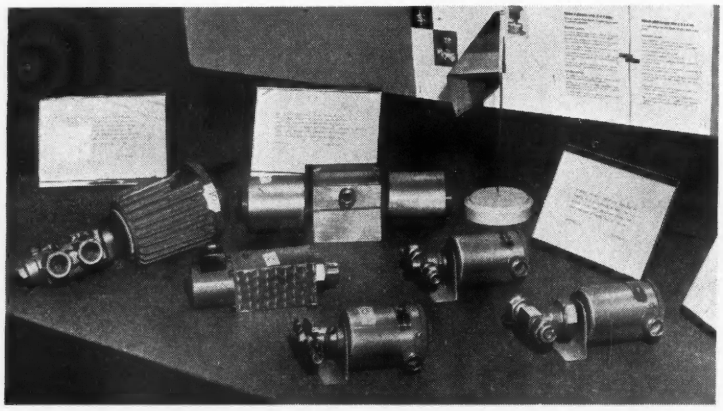
Crane Load Indication

Examples of solenoid valves for use with oil, brine, gas or steam included a slide valve with four positions, in one of which inlet and outlet are combined and piston connections blocked in. A display of load measuring equipment is of particular application to the indication of crane loading and the prevention of overloading. A steel ring is shackled into one of the crane cables to indicate either the absolute value of the load, or the percentage of the maximum load allowable when the jib is in any position. When the steel ring is placed in tension it is deformed and an armature moves between two transformers in a bridge circuit supplied with current at mains frequency. The out-of-balance current is sufficient, without any magnetic or electronic amplification, to actuate percentage load indicating meters and/or audible warnings, three-colour visual indicators and circuit-breakers as maximum permissible load is approached or exceeded. The equipment is also readily adaptable to weight measurement. On the same stand was a display of transducers for the detection of strain, pressure, vibration, torque and angular displacement, together with an oscillator/amplifier with flat response from d.c. to 1,200 c/s.

Magnetic tape recording equipment exhibited included very compact lightweight units designed for precise airborne, marine and vehicular data recording. These units are available with from two to 14 tracks, each adaptable to recording needs by means of plug-in amplifiers, and four tape speeds are available. Other rack-mounted equipments have a frequency response from 87 c/s to 87 kc/s and are also provided with from two to 14 tracks, whilst up to 90 channels of quasi-static data can be recorded on each tape track by means of pulse width modulation. In this technique momentary voltages are sampled from each channel by a rotating commutator, and these voltages determine the width of pulses recorded on the track.

A phase detector on show was developed in order to measure with an accuracy of 1 per cent or 0·1 deg time delays or phase angles in colour television and similar systems where constant time delay for all frequency components is of vital importance. A variable delay line is followed by a differential tuned amplifier and a balanced phase detector, and the unknown delay or phase angle is read off the dials of the variable delay at zero output indication. Two deviation test bridges intended for testing components such as resistors, capacitors and inductors, read directly in percentage deviation from a chosen standard. Measurements are made at 1 kc/s and at 100 kc/s respectively and three calibrated and three blank interchangeable scales are supplied with each instrument. These instruments are produced by the parent company of B. & K. Laboratories, Ltd., as are a range of acoustical measuring instruments, including an audio-frequency response and spectrum recorder built up of a beat frequency oscillator, and an a.f. spectrometer containing 27 fixed, third-octave band-pass filters covering from 40 c/s to 16 kc/s, the outputs from which are fed into a level recorder with ten different paper speeds, mechanically coupled to the filter selection dial: thus a frequency spectrum is plotted. This equipment was demonstrated recording the frequency response of a loudspeaker-microphone combination. A spectrum analyser for the range from 10 Mc/s to 44 kMc/s combines high sensitivity, simplicity of operation and portability. It incorporates a single tuning control, direct reading linear dial, five interchangeable tuning units to cover the range, and adjustable frequency dispersion: the spectrum is presented as a display on a 5in cathode-ray tube, and a frequency marker enables frequency differences to be determined.

A wide range, high output sweeping oscillator generates an output of 1 V held constant within 0·05 dB by a fast acting automatic gain control circuit and followed by additive attenuators providing up to 60 dB of attenuation. A



Left : Range of solenoid valves

Spectrum analyser with c.r.t. display and (right) compact tape recorder

single tuning range covers the spectrum from 50 kc/s to 50 Mc/s and the sweep width is continuously variable from 4 Mc/s to 50 Mc/s. A display of measuring instruments included concentric-dial decade units: these were very compact and convenient to read, and the accuracy of a six-decade resistance box was quoted as 0·05 per cent plus 0·010 ohm.

A stroboscope shown supplies extremely short flashes from a special neon lamp. Flashing rates up to 14,400/min are available, or the flashes can be triggered by external voltage pulses or by an external synchonisation contactor operated by a machine under observation. Also manufactured by the same company is an electronic tachometer, consisting of a rotor attached to the shaft under observation, a pick-up and a frequency meter. Alignment between rotor and stator is not at all critical.

Several ranges of nuclear instrumentation included an ultrascaler comprising plug-in decade circuits, mechanical register, stable h.v. supply for Geiger, scintillation or proportional counters and a range of input sensitivities, also portable scintillation counters with multi-stage transistor amplifiers and low energy discriminators ranging down to 70 keV for distinguishing between different radio elements and to cut the background counting rate to the minimum.

AMPLIFIERS AND TRANSISTORS

OPENING an informal discussion on the performance of d.c. amplifiers at a joint meeting on 26th March of the Measurement and Control Section with the Radio and Telecommunication Section of the Institution of Electrical Engineers, Mr. K. Kandiah referred to the numerous designs in connection with electronic equipment for measuring small steady or slowly varying voltages and currents.

Directly coupled valve amplifiers were, he said, simple and popular for portable instruments but not highly accurate. Even with heater voltages maintained within 0·1 per cent the drift was generally greater than in vibrating reed electrometers, which could measure currents of 10^{-14}A within one per cent. Chopper amplifiers had high accuracy above 10^{-10} A with only very slight drift over many days. The magnetic modulator could use a high modulating frequency and hence provided a wide band, but was not suitable for very small currents in view of the large number of turns of very fine wire in its input winding and it was subject to major zero errors. For larger currents the magnetic amplifier at mains frequency was the most reliable form of d.c. amplifier. In measuring small voltages, small temperatures with thermocouples and in other applications where the signal was a few microvolts, the chopper amplifier, magnetic modulator and reflecting galvanometer provided the only means. The small thermionic valve suffered from serious practical limitations as a d.c. amplifier.

Transistors for d.c. amplification were dealt with by Dr. G. B. B. Chaplin who referred to the limit to their sensitivity as determined by random thermal noise or by drift. This drift, he said, was mainly a function of ambient temperature, which was specified in terms of a range for general purpose units such as from 20 to 50 deg C. Two kinds were described. Directly coupled types had advantages in simplicity and small size, but had a large temperature-dependent voltage drift at all frequencies. Three chopper types, for use in conjunction with high-gain a.c. amplifiers, which had low impedances and gave little trouble from pick-up were particularised—the transistor, the mechanical and the silicon-diode. The silicon transistor was not yet commercially available in this country but might have a drift, when used as a chopper, as low as 10^{-10} A.

National Research Development

THE report of the National Research Development Corporation for the year ended 30th June, 1956 (H.M. Stationery Office; price 1s), after referring to the appointment of Sir Alan Saunders as chairman in succession to Lord Mills, reviews the progress of work on various development projects. Dealing with electronic digital computers, it says that as the result of pioneering effort over six years, the Corporation's contractors are now making and selling such machines on their own account, subject to licensing arrangements with the Corporation. Five of the six big computers referred to in earlier reports have now been delivered and installed and the sixth is complete.

The production prototype Pegasus computer, of which the Corporation has ordered nine, in addition to the prototype, has been completed and has proved entirely satisfactory. One of the production machines is to be reserved for the Corporation's own use.

Among the new projects commenced during the year were Professor Williams' variable speed induction motor. The Corporation is giving some support for the development of this in the Department of Electrical Engineering at Manchester University. The design of this new s.c. machine enables continuous speed variations of the order of two or three to one to be obtained without the complexities of slip-rings, commutators and brush gear associated with known forms of variable speed a.c. drive. The machine operates by virtue of a movable pole structure and good efficiencies are realisable in machines of quite moderate size. The rights in several patent applications relating to this motor have been transferred to the Corporation.

INDUSTRIAL NEWS

E.D.A. and Purchase Tax

Representations have again been made to the Chancellor of the Exchequer upon the subject of purchase tax on electrical appliances by the British Electrical Development Association.

The Association says it realises that it might be impossible immediately to remove the tax from all domestic electrical equipment but it suggests that consideration should be given to the following points:—

(*a*) The removal of the tax at the lower rate on kitchen electrical equipment, which was imposed in October, 1955.

(*b*) The withdrawal of tax at the higher rate—or at least its reduction to the lower rate—on electric water heaters, home laundry equipment, vacuum cleaners, refrigerators, space heaters, and fire kindlers.

(*c*) The freeing from tax of fluorescent tubes (as recommended in the Ridley Report).

(*d*) Permitting the sale to domestic consumers, without tax, of the "off-peak" electric storage block heater, the sale of which is at present restricted to commercial and industrial users.

Among the points stressed are that electricity makes the best use of the nation's fuel resources; electrical appliances save labour; that the load factor could be improved by encouraging the domestic use of electricity, particularly at off-peak periods; and that electrical methods assist compliance with the provisions of the Clean Air Act.

Closing of Appointments Offices

The Minister of Labour and National Service has announced that the three Appointments Offices in London, Manchester and Glasgow have been closed as from 29th March. In their place, at about fifty of the larger Employment Exchanges, a specialised service will be maintained for persons seeking professional or senior executive posts, and for employers seeking persons in these categories. At these Exchanges, information about careers in the professions and allied occupations will be available to inquirers. The arrangements for the Technical and Scientific Register and the Nursing Appointments Offices will not be changed.

New English Electric Headquarters

Plans for the new office building to be put up on the Gaiety Theatre site, Strand, W.C.2, by the English Electric Co., Ltd., have now been agreed with the L.C.C. Work on the demolition of the shell of the dismantled theatre is expected to start shortly. When complete, the new eight-storey building, designed by Dr. Charles Holden, of Adams, Holden & Pearson, will have a dominant vertical main entrance and frontage facing down the Strand, and two street frontages along the Aldwych and Strand, joining with those of Marconi House. An enlarged central light court, common to both buildings, will be formed. The new building, together with Marconi House already occupied, will form one integrated building to accommodate the headquarters staff of the English Electric group of companies. On the main roof there will be an observation room, through which will run a mast carrying a radar scanner. A basement garage will accommodate some 35 cars. An off-peak thermal storage central heating system will be installed.

Artist's impression of the English Electric Co.'s new office block on the Gaiety Theatre site

Gift for Technical Education

The Hotpoint Electric Appliance Co., Ltd., has given £3,200 towards a general science laboratory at Peterborough Technical College. Mr. H. F. Adams (director of manufacture) handed the cheque to Ald. J. Mansfield, chairman of Peterborough Joint Education Board, at a recent meeting of the Board.

Commonwealth Uranium Supplies

As the outcome of discussions during the past year between representatives of the Federal and Territorial Governments of the Federation of Rhodesia and Nyasaland and the United Kingdom Atomic Energy Authority, the Authority has expressed its readiness to buy annually in the Federation chemical concentrates containing 500 tons of uranium oxide. Ten-year contracts up to 1972 will be offered and the prices offered will be "reasonable" in the light of prevailing world prices. Later the Authority intends to offer to purchase from small producers in any one year uranium-bearing ores containing up to a total of 100 tons of uranium oxide.

The Authority has promised technical help to the Federation in the search for uranium and is prepared in suitable cases to carry out prospecting operations itself.

At last week's meetings in Bermuda between Mr. Macmillan and Mr. Selwyn Lloyd and the Canadian Ministers approval was given to a contract by which the U.K. Atomic Energy Authority will purchase from Canada uranium valued at about $115 million during the next five years. Supplies after this period will be the subject of future discussions.

Germanium Power Rectifiers

The adoption of the B.T.H. germanium power rectifier for traction purposes is described in a four-page illustrated leaflet (B.T.H. Publication G. 12104). Brief descriptions of the nature of germanium and of the construction of a germanium power rectifier are given. Traction rectifier equipment, using germanium, together with a schematic diagram of the connections of rectifier equipment on a train, are also included. The leaflet concludes with data of tests and efficiencies collected during runs on a train equipped with a germanium rectifier.

Wage Increase for Electricity Workers

Manual workers in the electricity supply industry are to get a wage increase of 2½d an hour back-dated to 1st March. This was agreed by the National Joint Industrial Council for the industry at a meeting in London last week.

A spokesman for the Central Electricity Authority told a Press Association reporter that 120,000 workers were affected and that the award would cost the Authority about £3,250,000 a year.

A fortnight ago the trade union side

rejected an offer by C.E.A. representatives of an increase of 1½d an hour and referred the matter to their Executive Councils. It had already been agreed by both sides that any increase should be applied from the first full pay period following 1st March. The men involved work mainly in power stations and substations. They received an increase of 4d an hour last year at a cost to the Authority of £4 million in a full year.

Iron and Steel Plate Import Duty

Under the Import Duties (Exemptions) (No. 15) Order, 1956, the import duties on a wide range of iron and steel products, including almost all plates, are suspended until 18th September. After consultation with the Iron and Steel Board about the supply position, the Government has decided to prolong until 18th March, 1958, the suspension of import duty on such plates. A new Order, the Import Duties (Exemptions) (No. 4) Order, 1957 (S.I. No. 503), has been made, and will come into operation on 19th September next. The question of further suspension of import duty on other iron and steel products is being examined; an announcement in respect of the duties on these other products will be made in due course.

Aluminium Conductors for Quebec Hydro

An order for aluminium conductors to the value of over $2 million has been placed by the Quebec Hydro-Electric Commission in Canada, with the Aluminium Wire & Cable Co., Ltd., Swansea. The conductors will be used for the 300 kV transmission lines from Bersimis to Baie Comeau, and for the eastern part of the 300 kV line from Bersimis to Montreal.

Southern Areas' New Subsidiary

Southern Areas Electric Corporation has formed a new wholly-owned subsidiary company under the title of New Day Electric (Sales), Ltd., to handle in the first instance the products of New Day Electrical Accessories, Ltd. (of Birmingham), and Gillott Electro Appliances, Ltd. (of Chalford, Glos.). The directors of the new company are Lord Gridley and Mr. J. W. C. Milligan (chairman and managing director, respectively, of the Southern Areas Electric Corporation Group) and Mr. J. A. Fraser (as managing director).

E.M.I.-Thorn Electrical Arrangements

The domestic radio and television receiver interests of Electric & Musical Industries, Ltd., and Thorn Electrical Industries, Ltd., are to be merged in a new jointly-owned company under the chairmanship of Mr. Jules Thorn. The new company will be responsible for the design and marketing of all receivers under the Ferguson, His Master's Voice and Marconiphone trade marks. Production will be mainly concentrated in the Thorn factories at Enfield, Middlesex, and Spennymoor, Co. Durham. The separate marketing organisations for the three brands will continue to operate.

It is stated that these arrangements for the rationalisation of production will result in manufacturing economies which should place the new group in a favourable position to compete more effectively in home and overseas markets and to meet the challenge of European economic integration.

Power for Bath and West Show

For the first time a dual fuel internal combustion engine is to be included as part of the generating plant for the power supply at the Bath and West Agricultural Show to be held at Swindon from 29th May to 1st June. As on previous occasions the main equipment will consist of two 400 kW alternator sets incorporating Lister-Blackstone ERS8 turbo-charged diesel engines, each with an output of 600 b.h.p. at 750 r.p.m., driving E.C.C. alternators.

This year in order to secure complete flexibility and to demonstrate the potentialities of obtaining a supply of electricity from gas, a dual fuel engine-driven alternator will complete the plant. This will comprise a Lister-Blackstone six-cylinder dual fuel engine, type EVDF6, running at 600 r.p.m. and direct coupled to an E.C.C. single pedestal bearing alternator.

Philips Birmingham Branch

The Birmingham branch of Philips Electrical, Ltd., is now operating from new premises at 107-108, Lionel Street, Birmingham, 3. The company's Midlands regional headquarters will continue to function separately at 28, Ludgate Hill, Birmingham, 3. Dealing principally in lamps, lighting equipment and electrical appliances, the new building possesses over 10,000 sq ft of space and houses offices, stores and a trade counter/showroom. The last is situated on the ground floor and is furnished and decorated in modern style. There are attractive displays of the lamp range, "Philishave" dry shavers and "Infraphil" infra-red lamps, as well as "prestige" displays of other products including radio receivers, tape recorders, radiograms and gramophone records. The showroom window, of the through type, is similarly laid out.

On the same floor is a medical electronics service department dealing with this type of equipment for the whole of the North of England. Adjacent to the service department is a stockroom where the X-ray films are stored. The first floor is taken up by managerial offices and invoicing, etc., departments. The second floor is devoted to bulk stores.

The lower ground floor has a staff canteen with a modern kitchen equipped with two electric cookers, a refrigerator and a 15 gal electric water heater.

The lighting of the building has been planned by the Philips lighting design service (Midlands Region), in collaboration with their colleagues in London so far as the trade counter area is concerned. The Philips "gearless" fluorescent system is used, except in the stores, etc., areas where tungsten lighting is employed. The electrical contractors were Parker, Winder & Achurch, Ltd.

Canadian Market for Portable Tools

A report has been prepared by the United Kingdom Trade Commissioner Service in Canada on the Canadian market for portable power-operated hand tools. In this it is stated that the market is increasing steadily, and while there is some demand for pneumatic tools, 80 per cent of the total sales in Canada are for electrically-powered tools. Imports represent at least 90 per cent of the total sales, but the United Kingdom's share of the market is only about 5 per cent.

The trade counter/showroom of Philips Birmingham Branch

A strong advertising programme is essential to obtain worthwhile sales, both to industry and in the domestic market. Adequate servicing facilities are essential. The report is issued by the Information Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1.

Atomic Plant Pipework Contract

A contract for the installation of pipework at the atomic plant at Springfields, near Preston, has been awarded to Mitchell Engineering, Ltd., by the United Kingdom Atomic Energy Authority. Work in this contract falls into several stages and the value of the first stage is estimated at several thousand pounds.

Furnace Agreement Terminated

Since 1936 Birlec, Ltd., has been building a range of direct-arc electric melting furnaces for steelworks and foundries. Under an agreement with the Pittsburgh Lectromelt Furnace Corporation, U.S.A., these furnaces have incorporated in their design the joint experience of the two companies. Recent changes in ownership and policy of the American company, however, have led Birlec, Ltd., to terminate the agreement as from 31st March. Birlec arc furnaces will continue to be supplied by Birlec, Ltd., for the full range of melting and smelting requirements of metallurgical industries.

Consolidated Pneumatic in India

The Consolidated Pneumatic Tool Co., Ltd., has formed a new company under the title of the Consolidated Pneumatic Tool Co. (India) Private, Ltd. The directors are Mr. G. J. Coffey, Mr. Norman Readman and Mr. V. Nimbkar (managing). The new company will operate in Bombay where new factory premises will be constructed. Products to be made in India are pneumatic tools, rock drills and demolition tools, pumps, and air compressors. The new company will be complementary to the Consolidated Pneumatic branches in Bombay and other Indian cities.

Improved Defrosting Technique

The Pressed Steel Co., Ltd., has been granted a British patent for improvements to the refrigeration systems of certain types of "Prestcold" refrigerators. It covers an invention relating to vapour-compression refrigeration systems in which diversion of relatively hot vapour conveyed from the discharge side of the compressor to the evaporator effects periodical defrosting of the evaporator, sometimes referred to in every-day language as a "hot gas defrosting."

Batti-Wallahs' Society

Few industries have developed so rapidly or have had such a revolutionary effect upon civilisation as the cinema industry. At the Batti-Wallahs' Society luncheon last week, Mr. Ernest Blake, of Kodak, Ltd., gave a talk on "Sixty Years of Cinema Photography." One of the pioneers of the film industry, he briefly reviewed its development from its beginnings to the present day, reviving pleasant memories of films and film stars of earlier days. Mr. W. C. M. Couch (president), who presided, announced that the annual meeting of the Society would be held on Wednesday, 10th April, and Mr. T. C. F. Bigland announced that the speaker at the next luncheon (Wednesday, 24th April) would be Mr. L. Mooney, whose talk would be on "The Size of the Universe."

Members of the E.D.A. Traction Committee leaving the George Hotel, Walsall, before their tour. Mr. W. S. Lewis is third from the left in the front row, and Mr. R. Edgley Cox on the right

Millionth Domestic Refrigerator

During the run of the Ideal Home Exhibition at Olympia, the millionth visitor was presented by Electrolux, Ltd., with the millionth domestic refrigerator made at the company's Luton factory. The presentation was made to Mr. and Mrs. H. A. Perry on the Electrolux stand by Mr. J. B. Redman, general sales manager.

Australian Restrictions Relaxed

Substantial increases in import quotas were announced this week by the Australian Government. Quotas in Category "B," which includes most consumer goods, are to be increased by 66⅔ per cent and Category "A" goods by 20 per cent in most cases. Electrical appliances are included in both sections.

B.I.M. to Move

The headquarters offices of the British Institute of Management and the Institute of Industrial Administration, at present at 8, Hill Street, London, W.1, are being transferred to 80, Fetter Lane, London, E.C.4. The move will take place in the latter half of May. The Institute of Personnel Management, a separate body which is at present occupying part of the premises in Hill Street, will also take offices in the new "Management House."

E.D.A. Traction Committee Visits Walsall

Members of the British Electrical Development Association Traction Committee, the chairman of which is Mr. W. S. Lewis (chairman, Midlands Electricity Board), visited Walsall, Staffs., on 27th March. After a business meeting at the George Hotel, Mr. Lewis and members of the Committee were escorted by Mr. R. Edgley Cox, manager of the Walsall Corporation Transport Department, and members of the Walsall Transport Committee on a tour of inspection of the town's trolley-bus system, which is the only one to date to have the latest 30ft long double-decker trolley-buses on two axles.

Ekco South African Expansion

Mr. E. K. Cole, chairman of E. K. Cole, Ltd., has announced that arrangements have been completed for the company to take a substantial shareholding in Kruger & Wilson, Ltd., which represents "Ekco" interests in South Africa and the Rhodesias.

Smoke Abatement Conference

The National Smoke Abatement Society, Palace Chambers, Bridge Street, London, S.W.1, has published the *Proceedings* of the Southport Conference, 1956. This volume (price 12s 6d, postage 3d) is of topical interest and practical value because of the authoritative papers and discussions it contains on the new Clean Air Act, much of which is now in force.

Trade Announcements

On and after 7th April the telephone number of the Scottish office of **Wild-Barfield Electric Furnaces, Ltd.**, at 147, Bath Street, Glasgow, C.2, will be City 4878.

Aerialite, Ltd., has moved its Bristol Aerialite/Nettle depot to Portland House, Portland Square, Bristol (telephone: Bristol 26130).

The Preston office of the **A.E.I. Lamp & Lighting Co., Ltd.**, is now at 154-158, Fylde Road, Preston, Lancs. (telephone: Preston 57891/2).

GENERATION AND DEVELOPMENT

C.E.A. Contracts

Contracts have been placed by the Central Electricity Authority during the past month for power stations, transforming stations and transmission lines, amounting in the aggregate to £5,284,800. They include the following:—

Belvedere power station, near Erith: Foundations for two turbo-alternator sets.—John Mowlem & Co.

Drakelow "B" power station, Burton-on-Trent: Tower foundations, circulating water pump house foundations, ponds and culverts.—Bierrum & Partners. Three cooling towers.—The Davenport Engineering Co.

Skelton Grange "B" power station, Leeds: Foundations.—J. L. Kier & Co.

Ffestiniog power station: Four 105,000 h.p. water turbines, governors, storage pumps and valves.—English Electric Co.

Carlisle substation: 132 kV switchgear.—Ferguson Pailin.

Rochdale, Pyle and Hams Hall substations: 120 MVA, 275/132 kV transformers.—Ferranti.

Harker substation: 120 MVA, 275/132 kV transformers.—C. A. Parsons & Co.

Connah's Quay substation: 120 MVA, 275/132 kV transformers.—English Electric Co.

Sundon substation: 120 MVA, 275/132 kV transformer.—Crompton Parkinson.

Newton Abbot substation: 45 MVA, 132/33 kV transformers.—C. A. Parsons & Co.

Melksham substation, Wilts: 120 MVA, 275/132 kV transformers.—English Electric Co.

Various substations: Supply of 132 kV transmission towers.—Blaw Knox.

Search for Nuclear Sites

Dungeness, Kent, is among the many coastal points being examined by the Central Electricity Authority in furtherance of the Government's nuclear power programme. Members of the Planning Committee of the Kent County Council were told last week that the Authority was approaching the owner of land at Dungeness with the intention of making trial borings to test the foundation capacity of the subsoil. A spokesman for the C.E.A. said in London that similar investigations were being initiated at many places around the south coast, from Kent to Wales.

Hinkley Point Project

Somerset County Council last week agreed that, subject to a public inquiry being held and safeguards provided, it would offer no further objection to the Central Electricity Authority's proposal to build a nuclear power station at Hinkley Point, Bridgwater Bay. The Planning Committee, which reported that protests against the proposal continued to be received, stated that the C.E.A. was unable to site the proposed buildings on land 600 or 700 yd north-east of Benhole Farm, as suggested, because this would add £2 million to the capital cost and involve an additional expense of £20,000 a year. The Authority had offered to construct the buildings some 1,000ft to the west of the site originally proposed and this the Committee had accepted. Public access to the foreshore would be restricted only during the period of construction. Transmission lines from the station would be routed clear of the Quantock Hills.

Effect of New Bulk Supply Charges

Following the publication last week of the Central Electricity Authority's increased bulk supply tariff for 1957-58, spokesmen for a number of the Area Boards have indicated the possible effect on retail charges. For the SOUTH EASTERN Board it was stated that an increase in charges to consumers was "inevitable" but it was impossible to give any idea how much. A SOUTHERN Board spokesman said it was too early to make any forecast "except to draw the normal conclusion in these matters—it's the customer who pays."

Mr. Bellamy, chairman of the YORKSHIRE Board, gave the cost of the new charges to the Board as about £500,000 in a full year. The announcement had come after the Board had revised its tariffs, he said, and it was not likely that these would be touched until next year.

The chairman of the EAST MIDLANDS Board recently intimated that there would be no increases in charges before October. A spokesman said last week that in reviewing tariffs after that the Board would have to take into consideration the new bulk supply charges.

Both the EASTERN and the MIDLANDS Boards were stated to have made allowances for the increases in their new tariffs published recently but the SOUTH WALES Board's revised tariffs, fixed earlier, do not take account of the new bulk supply charges; a spokesman said that the increase was bound to have a substantial effect on the Board's finances, and that careful consideration would need to be given to increasing tariffs still more in the next twelve months.

The SOUTH WESTERN Board had fixed new block tariffs covering domestic and small commercial and industrial users and does not expect to make a further increase.

New charges for the NORTH WESTERN Board's Area, which were to have been announced last week, will not be made known until 8th April. Mr. F. Kenyon, chairman of the Consultative Council, explained that the Council had recommended certain amendments and the Board had indicated that it was prepared to give some alleviation. Because of the increased bulk supply charges, he said, it was impossible to give any guarantee that tariffs would be stabilised for twelve months.

Both the LONDON and NORTH EASTERN Boards were stated to be considering the effect of the new charges but could not yet say what action would be taken.

Servicing Turbo-Alternators

An interesting development in the servicing of turbo-alternators has just been introduced by the British Thomson-Houston Co., Ltd., which has recently completed two mobile units providing full facilities for carrying out normal adjustments and repairs at power stations.

Each unit consists of a weatherproof 14 ton road vehicle equipped with heating and hydraulic equipment for the removal and replacement of turbine wheels, as well as milling machines, surface grinders and coverband punches, etc.

A further development is a specially designed lathe which has been built for transport in a low loader. The lathe is in sections which can be assembled on the power station floor and is capable of accommodating steam turbine rotors up to the

Interior of mobile workshop showing two of the three milling machines

120 MW l.p. size. The plant also includes a machine for the static balancing of a completed rotor, the balance being suitable for mounting on the turbine lower half casing. By carrying out repair work on the spot and avoiding transport of worn parts to a factory, the time a machine is out of commission is reduced to the minimum. After completing trials under site conditions, the first of these mobile service units left the works on 6th March for power station duty.

Revised Midlands Charges

As briefly reported in last week's issue, the Midlands Electricity Board is increasing its charges to meet higher costs. The new tariffs come into force from the first meter readings after 30th April.

Announcing the increases, the chairman of the Board, Mr. W. S. Lewis, said that it had been necessary to budget for an increase in revenue of £2,600,000 in a full year. The extra costs which had led up to these increases, he said, were outside the Board's control. The major items were wage and salary awards, coal prices, payments in lieu of rates, and bulk supply charges. The increase in the bulk supply tariff just announced would cost them £540,000 annually. This had arisen following a decision that the industry should raise more money out of revenue for capital work.

As the revised tariffs would not take effect until after the beginning of the financial year, it was estimated that the additional revenue in 1957-58 would be only about £2 million, but the Board hoped to offset part at least of the loss shown in 1956-57 and, if all things remained equal, to come out on the right side in the following year.

Commenting on the new tariffs, Mr. Lewis said the Board was sure that the concession on outside lighting would be welcomed by shops and stores and would encourage the use of more decorative and advertising lighting. Hotels, hostels, boarding houses and boarding schools, some of which considered the effect of the floor area block tariff prejudicial, would be helped by the change in the combined premises tariff. The new storage tariff would, it was hoped, stimulate still greater interest in floor warming for shops, offices, factories and homes.

The new tariffs are as follows:—

Domestic.—5½d/kWh for the first 14 kWh per room per quarter (instead of 4½d/kWh for the first 12 kWh as at present) but only the first 7 kWh will be charged at 5½d for each room in excess of 10. For prepayment supplies the primary block rate will go up from 5½d to 6½d. In all cases the secondary rate of 1d/kWh is unchanged.

Commercial and Small Industrial Consumers — FLOOR AREA BLOCK TARIFF. 5½d/kWh (instead of 4½d), for the first 40 kWh per 100 sq ft of floor space up to 1,000 sq ft. The 4d rate for additional area and the secondary rate of 1d/kWh remain unchanged. In future the 5½d rate will not be charged for outside lighting from fittings attached to buildings or for floodlighting, supplies for which will be added to those used inside. MAXIMUM DEMAND TARIFFS. Hitherto limited to demands of 20 kVA or more, these tariffs are now available as an alternative to the floor area block tariff, subject to a minimum demand charge of £4 per month.

Combined Private House and Commercial Premises.—Bedrooms and private sitting rooms will now be considered as part of the domestic section and charged for on this basis instead of on floor area. For dormitories 14 kWh will be charged for at 5½d/kWh for each 200 sq ft of floor area. Reassessment of residential premises in this group will be carried out before the tariff is applied.

Farms.—The 4½d primary rate is increased to 5½d and the concession on outside lighting made to commercial consumers also applies.

Outside Lighting (car parks and sports arenas, etc.).—Primary block rate increased from 4½d to 5½d/kWh.

Large Industrial Consumers.—Increase of 1s 9d/kVA of m.d. in each step of the tariff up to 1,000 kVA and 1s 3d for demands over 1,000 kVA. Monthly "unit" charges reduced to 0·72d for the first 180 kWh/kVA of m.d., 0·64d for the next 180 kWh, and 0·57d for additional kWh, subject to coal cost price variation.

Storage Tariff.—New standard tariff for electricity supplied for storage purposes during restricted hours. H.v. supplies, 0·70d/kWh; l.v. supplies, 0·75d/kWh.

"Seeboard" Standard Commercial Tariffs

Standardisation of electricity charges in South East England will be completed on 1st April next year when the South Eastern Electricity Board is to introduce new tariffs to take the place of about 70 local commercial tariffs.

Mr. Norman Elliott, the Board's chairman, in announcing this said that the Board would obtain no extra revenue; the aim was to make charges fairer as between individual consumers. In place of the widely differing scales at present in operation, all consumers under the new tariffs would pay on the same basis. In addition, there would be available a wider range of tariffs more closely related to the types of load met.

Apart from flat rates, he said, the Board at present offered in the main only one tariff to cover varying uses of electricity. In future there would be four, i.e. an installed load tariff, a farm tariff, a church and community hall tariff, and a measured demand tariff. Alternative flat rates would continue to be available. About 65,000 of "Seeboard's" 1,150,000 consumers would be affected.

The four new tariffs are as follows:—

Installed Load Tariff.—Running charge of 1·1d/kWh and a quarterly charge (minimum 25s) based on the capacity of electrical appliances installed, as follows:—Lighting, 5s/100 W; cooking and storage water heating, 5s/kW; motors, 12s 6d/h.p. (or if the consumer wishes, at the standard flat rate for motive power); and space and process heating and miscellaneous purposes, 12s 6d/kW. Hotels, boarding houses, nursing homes and the like: for each bedroom not normally used as a sick room and for each private sitting room, 3s per room.

Farm Tariff.—As for installed load tariff but with the quarterly charge based as follows:—Lighting, 4s/100 W; storage water heating, 5s/kW; motors, 10s/h.p. (or alternatively the standard flat rate for motive power); and space and process heating and miscellaneous purposes, 10s/kW.

Church and Community Hall Tariff.—Apart from places of worship this tariff is available for church halls, community halls and similar premises in which the use of electricity from Monday to Friday during the winter is mainly outside the hours of 7 a.m. to 7 p.m., and within these hours is infrequent and for periods of short duration. Running charge 1½d/kWh and a quarterly charge (minimum 25s) based as follows:—Lighting, 2s 6d/100 W; cooking and storage water heating, 2s 6d/kW; motors, 6s 3d/h.p. (or at the standard flat rate for motive power); and space heating and miscellaneous purposes, 6s 3d/kW.

Measured Demand Tariff.—Annual demand charge in respect of the m.d. between November and March inclusive of £9/kW for the first 20 kW and £8 for each additional kW and £2 for each kW by which the demand during the remaining seven months of the same year exceeds the demand paid for in the five winter months. The tariff is subject to consumers' paying for a winter demand of not less than 10 kW. "Unit" charge: 0·775d/kWh, increased or reduced at the rate of 0·0037d/kWh for each penny variation in the cost of fuel above or below 60s per ton.

Bedroom Heating

Municipal Engineering reports that Rotherham Rural District Council has decided to remove bedroom gas fires from 146 houses on seven different Council estates because fumes from one of the fires have been escaping into a next-door house. The flues are to be sealed and electric plugs installed.

Objections to Overhead Line

A public inquiry is to be held at Bispham, near Ormskirk, on 26th April into a proposal by the North Western Electricity Board to erect 4½ miles of overhead line from Wrightington to Burscough Bridge. The objectors, who claim that the line would spoil some of the most beautiful scenery in the county and cross valuable agricultural land, have suggested an alternative route.

OVERSEAS

£20 Million Power Station for Victoria

The Government of Victoria, Australia, has invited tenders from firms in Britain and the United States for the construction of a £20 million power station near the extensive brown coal deposits at Yallourn, 80 miles from Melbourne. The station will provide electricity for Melbourne and the rapidly expanding industrial areas of Victoria. When completed it will be the fifth to be erected since the war in this industrial belt of Victoria.

Higher Output in Rhodesia

The Federation of Rhodesia and Nyasaland's electricity output for 1956 was 15·2 per cent more than in 1955, totalling 2,643 million kWh against 2,294 million kWh in 1955. Of the major producers, both the Rhodesian Congo Border Power Corporation (which co-ordinates the output of four power stations in the Copperbelt) and Salisbury increased their output by 20 per cent. Bulawayo's output went up by 11½ per cent, and that of the Southern Rhodesian Electricity Supply Commission by a little under 9 per cent.

NEW ELECTRICAL EQUIPMENT

Argonarc Composite Rectifier

BRITISH OXYGEN GASES, LTD., Spencer House, St. James' Place, London, S.W.1, announce the introduction of a composite rectifier for their Argonarc welding process. The new rectifier is known as the ACR.150 and has been introduced to meet an increasing demand for small, comparatively lightweight equipment, giving a stable arc down to only a few amperes welding current.

This set can be used for welding materials, with the exception of aluminium and magnesium base alloys, up to approximately ⅛in thick. It has a current range of approximately 10 to 150 amperes.

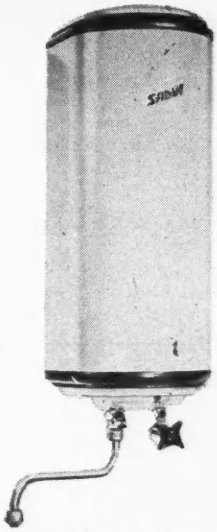
Apart from the stepless remote control current regulator, this set can be fitted with a spark starter and a crater-filling device (optional extra), comprising a series of relays, set to operate when the arc is broken at the end of the weld and causing the current to decay in steps.

This device ensures that the weld crater at the finish of the weld cools sufficiently slowly to solidify with the least tendency to cracking. The current steps can be varied to give either a rapid or a slow decay between 2 and 3½ seconds, according to the thickness of the material and the initial welding current employed.

A striking voltage of 70 is provided, to ensure rapid arc-striking throughout the current range, but more especially at very low welding currents. Argon gas and water time delay economisers are also provided, which operate automatically when the arc is broken. Remote control of the spark starter and inbuilt contactor is made from a standard 25 V two-position foot switch.

Water Heater

A new single-point electric storage water heater, the "Sadia Two-Plus," has been introduced by AIDAS ELECTRIC, LTD., Rowdell Road, Northolt, Greenford, Middlesex. It is a 1 kW model with a capacity of 2¼ gal and is basically the company's normal cylindrical water heater design with a new attractive outer casing, rounded in front, which fits flush to the wall. The overall dimensions are 22¼in high by 9in wide by 9in deep and the stove enamelled finish is in either cream or white with a choice of three band colours, blue, green or red. The tap is of a new design, with a nylon washer, and black moulded handle. The price is £11 plus £5 3s purchase tax in the United Kingdom.



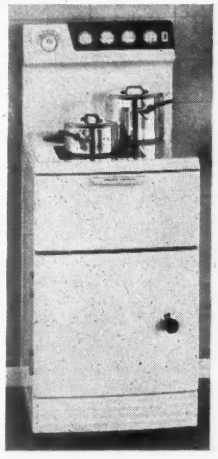
"Sadia Two-Plus" water heater

Electric Cooker

The new Tricity "Viscount" electric cooker, the latest to be announced by TRICITY COOKERS, LTD., 109, Kingsway, London, W.C.2, has a large quick-heating oven capable of taking a 36 lb bird, and an extra deep hot cupboard, fitted with a drop-down door. There is a choice of either right- or left-hand hinges for the oven door. The loading of the oven, which is thermostatically controlled, is 2·4 kW. Hob fittings include a 6¼in boiling plate as well as an 8in plate, and a grill boiler; the respective loadings being 1 kW, 1·8 kW and 2·25 kW. A "Simmerstat" is fitted to the 8in plate. Controls are mounted at eye-level on the top of the splash plate, which is so shaped that vapours are deflected from the controls.

The cooker is finished in either ivory or white vitreous enamel and colour is confined to the fascia panel which is available in leaf green, guardsman red, Dresden blue, apple green or mustard, in addition to black, white and ivory. The panel can be changed in a few minutes to suit any kitchen colour scheme.

The Tricity "Viscount" is 50⅞in high (36in to top of hob) by 21in wide by 23½in deep, and the voltage ranges are 200/210, 220, 230/240 and 250 a.c. Models for d.c. can be supplied to order. Accessories include a recipe book, grill pan and grid, grill deflector plate, two rod type shelves and a baking tin. The price is £35 or with 8in radiant plate in lieu of a solid one, £36 15s. A Horstmann time switch for any of the models costs £4 17s 6d extra.



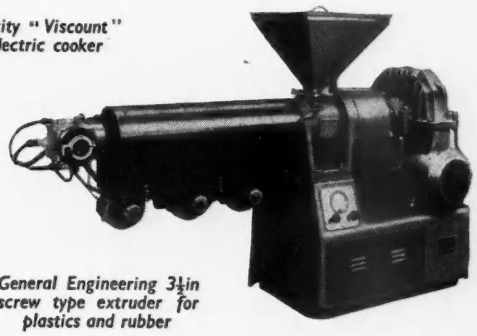
Tricity "Viscount" electric cooker

Plastics Extruders

A new range of screw-type extruders for plastics and rubber is offered by the GENERAL ENGINEERING CO. (RADCLIFFE), LTD., Station Works, Radcliffe, Lancs. The sizes available are 1½, 2½, 3½ and 4½in. Each machine is driven by an externally mounted continuously-rated variable speed motor, and this is coupled to the extruder through a vee-belt drive. The reduction gearing is of the worm type and the thrust bearing is separated from this to prevent thrust loads being transmitted back to the gears.

An open chamber, between feed and thrust boxes, prevents contamination of plastic materials by any oil seepage, and also permits free fall out of any plastic fines which may work back from the feed section. Provision is made for water-cooling the screw and feed box, and either air or water cooling can be provided on the barrel zones, when required, as an optional extra. The heating of the barrel and die-head zones is direct-electric, using cuff and plate type heaters. Temperature control is by proportioning instruments mounted in a cabinet, separate from the extruder.

The barrel is in one piece, and small modern die-heads of many kinds are available for such duties as film and sheet production, tubes and miscellaneous sections, large pipes, cable insulation and sheathing, and also for lay-flat work. The machines are suitable for the extrusion of all kinds of thermoplastics such as acetates, styrenes, polyethylenes, vinyls, and nylon.



General Engineering 3½in screw type extruder for plastics and rubber

Financial Section

STOCKS and SHARES

STOCK Exchange markets have continued to move with the ebb and flow of hopes for a solution of the engineering and shipbuilding wages disputes, which vie with next Tuesday's Budget as the principal factor in the immediate outlook for investment. Apart from general influences, the now rapid flow of dividend declarations and company results for 1956 is producing reactions from individual securities concerned. A good deal of the recent news, particularly from the engineering sections of industry, has produced more evidence, often disconcerting, of the tendency for profits to be squeezed between rising production costs and the effort to hold down selling prices. In the electrical market the signs of this process had already been inferred from the 1956 figures from such companies as A.E.I. and Brush, and have now been augmented by the report of a material fall in earnings by A. Reyrolle & Co.

Reyrolle Results

Estimates of the Reyrolle results for 1956 were proved by the event to have been over-optimistic, the price of the £1 shares falling initially from 112s to 101s 3d on the announcement of the figures. These appeared from the preliminary statement to mark a reduction of earnings by about a quarter in comparison with those of 1955. The final dividend is being raised to 11 per cent, on capital increased by half as a result of last year's cash issue. With the interim of 6½ per cent paid previously, it makes a total of 17½ per cent for the year, and is calculated provisionally to have about threefold cover by the earnings available for distribution and reserves. The yield on the shares goes up to 3½ per cent and is still well below the average in the industrial market.

Irregular Market

C. A. Parsons £1 shares fell 5s to 65s in sympathy with those of Reyrolle & Co.: the former company's annual results are expected to be made known shortly. Other leading shares in the nuclear power construction groups were mostly showing losses of a shilling or so in the early part of this week. Exceptions were the further improvements in Clarke Chapman and International Combustion, both of which companies are partners with Crompton Parkinson in the nuclear power field. An interesting move was the further recovery in Brush, which have picked up from 4s 6d to 6s (the official quotation remained at 5s 3d) since initial disappointment over the passing of the dividend: there has been unconfirmed talk of an association between this company and Hawker-Siddeley. E.M.I. and Thorn Electrical shares both showed net gains after news that the two companies are to merge their domestic radio and television interests. There was a sharp rise of 3s 3d to 18s 9d in Vactric, and Hoovers again went higher.

Enfield Cables

The £1 shares of Enfield Cables dipped from 15s 9d to 14s as a first

Price Changes in

Company or Board	Nom. Value	Middle price 1st April	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1957 Highest	1957 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	76½	—1	3	3	3 18 6	80	75
Brit. Elec. 1974/77	100	74½	—1	3	3	4 0 6	78¾	73½
Brit. Elec. 1976/79	100	79½	—1	3½	3½	4 8 0	81½	77½
Brit. Elec. 1974/79	100	89½		4¼	4¼	4 15 0	92½	87¼
Overseas Electric Supply								
Calcutta Elec.	£1	18/6		6†	6†	6 9 9†	19/-	18/3
East African Power	£1	20/-		7	7	7 0 0	20/6	19/3
Nigerian Elec.	£1	17/6		10	10*	11 8 6	18/6	17/3
Perak Hydro-Elec.	£1	14/9		10	10*	13 11 3	14/9	13/3
Equipment and Manufacturing								
Aberdare Cables	5/-	10/6x.d.		17½	17½	8 6 9	11/3	9/9
Aerialite	1/-	5/6		45	48	8 14 6	6/-	4/9
Allen, W. H.	£1	40/-		20	10*	5 0 0	40/-	33/6
Aron Elec. Ord.	£1	56/3		15	15	5 6 9	55/6	53/6
Assd. Automation	10/-	20/3	+9d	10	5	2 8 9	20/9	17/9
Assoc. Elec. Ord.	£1	62/6	—1/3	15	15	4 16 0	73/-	62/6
Automatic Tel. & El.	£1	61/3	+1/3	15	15	4 18 0	61/3	54/6
Babcock & Wilcox	£1	78/9	—1/3	15	15	3 16 3	82/6	71/6
Baldwin, H. J.	2/-	4/6		20	20	8 17 9	5/-	4/-
Bakelite	10/-	22/6	+9d	16	15	6 13 3	22/6	20/9
Berry's Electric	5/-	5/9		—	10‡	8 14 0	5/9	5/6
British Aluminium	£1	66/3	—1/3	12	12	3 12 6	70/6	63/9
B.I. Callender's	£1	50/9	+6d	10	12½	4 18 6	51/6	48/3
B.I. Callender's 6% Pref.	£1	21/9		6	6	5 10 3	21/9	20/6
British Tabulating	£1	52/-	+2/-	9	9	3 9 3	52/6	42/-
British Thermostat	5/-	27/-		20	25	4 12 6	27/6	25/9
British Vac. Cleaner	5/-	7/-	+3d	30	15*	10 14 6	8/-	6/6
Brook Motors	10/-	31/3		25	25	8 0 0	33/3	30/-
Brush Group	5/-	5/3	+3d	10	Nil	Nil	6/3	4/6
Bulgin, A. F.	1/-	5/-x.d.	+3d	50	40*	8 0 0	5/6	4/6
Burco Dean	5/-	11/-		22½	20	9 1 9	11/3	8/9
Chloride El. Storage "A"	£1	65/9	—6d	17½	17½	5 6 6	68/-	58/-
Clarke Chapman	£1	155/-	+10/-	22½	27½	3 11 0	7⅝	6¼
Cole, E. K.	5/-	19/3		17½	17½	4 11 0	19/6	16/6
Cossor, A. C.	5/-	6/3		15	Nil	Nil	7/3	5/9
Crabtree	10/-	24/6		20	20	8 3 3	25/6	23/3
Crompton Parkinson Ord.	5/-	16/3		16	16	4 18 6	17/9	14/6
De La Rue	5/-	17/6		30	30	8 11 6	19/9	16/3
Decca "A"	4/-	27/-	—6d	43¾	43¾	6 9 9	32/3	27/-
Desoutter	5/-	31/-	+1/6	30	32½	5 4 9	30/-	27/6
Dewhurst	2/-	6/6		30	16¼*	5 0 0	7/6	5/9
Dictograph Tel.	2/-	7/-		20	20	5 14 3	7/6	6/9
Dubilier Condenser	1/-	5/3		25	30	5 14 3	5/9	5/6
Duport	5/-	18/6	—3d	23	25	6 15 3	19/6	17/6
E.M.I.	10/-	30/6	+1/-	15	15	4 18 3	30/-	23/9
Electrical Components	5/-	7/3		25	25	8 12 6*	7/3	6/6
Elec. Construction	£1	25/-		8½	8½	6 16 0	25/6	21/9
Elliott Bros.	5/-	27/-	—6d	17½	20‡	3 14 0	29/-	26/3
Enfield Cable Ord.	£1	16/6	+3d	Nil	Nil	Nil	21/6	13/-
English Electric	£1	57/6		12½	14	4 17 6	58/9	47/6
English Electric 3¾% Pref.	£1	13/-		3¾	3¾	5 15 6	14/3	13/-
Ericsson Tel.	5/-	39/6	+6d	20†	22†	2 15 9†	41/-	33/3
Ever Ready	5/-	31/3	+6d	35	35	5 12 0	31/9	30/-
Falk Stadelmann	£1	39/-	+6d	17½	17½	8 19 6	38/6	35/-
G.E.C. Ord.	£1	55/-	—1/3	12½	14	5 1 9	57/9	48/9
G.E.C. 6½% Pref.	£1	22/6		6½	6½	5 15 6	23/6	22/-
General Cables	5/-	12/9		30	30	11 15 3	13/6	11/6
Greenwood & Batley	£1	46/3		17½	17½	7 11 3	46/3	45/3
Hackbridge Holdings	5/-	20/3		25	30	7 8 3	21/-	19/9
Hackbridge & Hewittic	5/-	15/-		30	23*	7 13 3	16/-	13/6
Heatrae	2/-	4/-		15	15	7 10 0	4/-	4/-
Henley's	10/-	16/9		10⅝	11½	6 17 3	17/-	15/3
Holophane	5/-	23/-		30	30	6 10 6	26/3	17/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

reaction to the appearance of the results for 1956, but were quickly restored to over 16s after further consideration had been given to the figures. These are stated to have been substantially affected by fluctuations in metal prices, the effect of which produced gains in the previous year but reduced the profit this time by £85,000. In all, group profits are down by about £100,000 to £103,000, and after taxation and a larger net charge for interest, the result is a small loss to compare with the 1955 profit. Preference dividends are being paid, but there is no distribution on the ordinary capital. Earlier this year the shares were taken up to 21s 6d on "bid" rumours which were subsequently denied by the company.

Electrical Investments

Company or Board	Nom. Value	Middle price 1st April	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1957 Highest	1957 Lowest
Equipment and Manufacturing—continued								
Hoover	5/-	36/6	+1/-	50	50	6 17 0	36/-	24/9
I.C.I.	£1	43/3	+1/6	10	10	4 12 6	43/9	37/9
Intl. Combustion	5/-	25/9	+9d	20	22½	4 7 6	25/9	20/-
Johnson & Phillips	£1	29/6	+3d	15	15	10 3 6	34/6	28/6
Lancashire Dynamo	£1	42/6		15	11*	5 3 6	45/-	36/9
Laurence, Scott	5/-	17/9		12½	15	4 4 6	17/9	13/9
Lister, R. A.	£1	29/3		9·3	10	6 16 9	30/6	26/9
London Elec. Wire	£1	53/9	+1/9	12½	12½	4 13 0	53/9	43/-
Lucas, J.	£1	32/6		7½	7½	4 12 3	33/9	30/6
Marryat & Scott	2/-	9/3		30	30	6 9 9	9/6	8/-
Mather & Platt	£1	55/6		15	15	5 8 0	56/-	51/3
Metal Industries	£1	23/-		9	Nil	—	25/-	20/3
Midland Elec. Mfg.	£1	47/6		12½	12½	5 5 3	47/6	45/-
Morphy-Richards	4/-	14/-	+3d	50	50	5 14 3*	14/-	11/9
Murex	£1	72/3	+1/9	20	20	5 10 9	72/3	65/-
Newman Ind.	2/-	2/6		10	10	8 0 0	2/6	2/1
Oldham & Son	1/-	2/6		20	17½*	7 0 0	2/6	2/3
Parnall (Yate)	5/-	7/6		14	12	8 0 0	8/-	5/9
Parsons, C. A.	£1	65/-	—5/-	10	10	—	70/-	50/6
Plessey	10/-	76/6	+6d	27½	30	3 18 6	77/6	61/-
Pye "A" Deferred	5/-	17/6		12½	12½	3 11 6	18/3	15/9
Reyrolle	£1	101/3	—8/9	16½	17½	3 9 3	110/-	90/-
Rheostatic	4/-	10/-		18½	12½	5 0 0	10/-	8/9
Richardsons Westgarth	5/-	18/-		16⅝	16⅝	4 12 6	19/-	17/-
Scottish Cables	4/-	17/9	—6d	27½	27½	6 4 0	19/3	15/-
Smith (England), S.	4/-	14/6		17½	17½	4 16 6	14/6	13/-
Southern Areas	£1	17/6		10	7½	8 11 6	20/-	13/9
Strand Elec.	5/-	7/6		15	15	10 0 0	8/-	7/3
Sturtevant	5/-	26/-	+6d	14·4†	15†	2 17 9†	26/-	24/3
Sun Elec.	£1	43/9		20	25	11 8 6	43/9	43/9
Switchgear & Cowans	5/-	14/3x.d.		20	25	8 15 6	15/6	13/6
Taylor Tunnicliff	5/-	12/9		15	15	5 17 9	13/9	11/9
T.C.C.	10/-	38/9		25	25	6 9 0	38/9	35/-
T.C. & M.	£1	29/-	—6d	8½	8½	5 17 3	31/-	24/6
Telephone Mfg.	5/-	7/-		10	10*	7 2 9	7/-	6/3
Thorn Elec.	5/-	20/9	+9d	15	15	3 12 3	21/3	16/3
Thornycroft	£1	37/6		15	12½	6 13 3	37/6	32/9
Tube Investments	£1	63/9	+2/3	22½	15*‡	4 14 0	63/9	58/3
Vactric	5/-	18/9	+3/3	15	17½*	4 13 3	18/9	12/9
Veritys	5/-	8/3		12½	12½	7 11 6	9/3	8/3
Walsall Conduits	4/-	13/3		70	20*	6 0 9	13/3	11/-
Ward & Goldstone	5/-	43/3		30	35	4 1 0	43/3	36/9
Watford	2/-	6/6		25	25	7 13 9	6/6	6/3
Westinghouse	£1	82/6	+1/3	18	18	4 7 3	82/6	72/-
West, Allen	5/-	13/9	+3d	15	15	5 9 0	14/3	12/3
Wolf Electric	5/-	19/6		20	20	5 2 6	19/6	17/3
Trusts, Transport and Communications								
Anglo-Portuguese	£1	23/9		8	8	6 14 9	23/9	20/6
Brit. Elec. Traction: Def. Ord. "A"	5/-	20/-	—6d	22½	22½	5 12 6	20/9	17/-
Cable & Wireless: Ord.	5/-	11/-		10	10	4 11 0	12/-	9/6
4% Loan	100	92½		4	4	4 6 6	92½	89
Calcutta Trams	£1	25/9		75†	8½†	6 12 0†	26/6	22/9
Cape Elec. Trams	£1	15/-	—6d	8	8	10 13 3	15/9	14/6
Marconi Marine	£1	33/6		10	10	5 19 6	33/6	31/-
Oriental Tel. Ord.	1/-	74/6		16	—	—	77/6	66/6
Telephone Rentals	5/-	11/-		12½	12½	5 13 9	11/3	10/3

Pifco

A newcomer appeared in the market this week with the introduction of Pifco Holdings 4s ordinary shares. Formerly a mining concern under the title of Filani (Nigeria) Tin, the business has been transformed by the sale of the mining assets and by the acquisition of Pifco, Ltd., makers of electrical appliances and accessories, for a sum of £650,000. Of this, about £148,000 is being satisfied in cash and shares, and the balance deferred. Profits in the current year are expected to be not less than £127,000, and given a continuance of earnings at that level, the directors would expect to be able to recommend dividends totalling 15 per cent for the year to April 1958. Such a distribution would be covered some seven times over by the indicated earnings, and provide a yield of 8 per cent on the shares at the price of 7s 6d at which early dealings took place.

Efco Issue

Another issue which is in progress is the "rights" offer of 208,700 new 10s shares at par by Efco, Ltd., which assumed its present title a year ago when it became a holding company, with its main subsidiaries the Electric Furnace, the Electric Resistance Furnace and the Electro-Chemical Engineering Companies. Fresh funds are being raised partly to finance the acquisition of the balance of the share capital not already held in Royce Electric Furnaces. Efco expect the figures for the twelve months just ended to show a satisfactory increase. A final dividend of 8½ per cent is indicated, to make a total of 12½ per cent with the interim already paid before the enlargement of the capital. On that basis the new shares at an inclusive price of 23s 9d (free of transfer stamp) would give a return of 5¼ per cent.

Company News

A final dividend of 10 per cent declared by the Telephone & General Trust applies to capital increased by last July's "rights" issue of shares, and is a point more than the rate forecast on that occasion. The total of 13 per cent is well covered as a result of the increase in the group balance to £304,000. Having improved to 48s, the £1 shares are on a yield basis of 5·4 per cent. British Aluminium £1 shares registered some disappointment over the results, which leave the dividend unaltered at a total of 12 per cent, and show no great change in the level of earnings. The shares were 1s 3d lower at 66s 3d. A. H. Hunt (Capacitors) 4s shares were also quoted lower, at 7s 6d, following the report of a lower profit: the dividend is brought up to 13¾ per cent, effectively the same rate as before.

REPORTS and DIVIDENDS

Enfield Cables, Ltd., in a preliminary statement for 1956, states that losses on fluctuations in metal prices reduced the profit by £85,000. In 1955 there were stock profits from the same source, but exceptional losses exceeded the profit by some £30,000. For 1956 the group profit, before taxation, is £12,105, as compared with £148,260 for the previous year. Taxation absorbs £28,636, and there is a loss for the year of £16,531 (against a profit of £79,012). Again no dividend is proposed on the ordinary stock, and the balance carried forward is £99,025 (against £142,614 brought in).

A. Reyrolle & Co., Ltd., in a preliminary statement, report that after providing £1,303,353 for taxation, the net profit for 1956 is £1,259,920. The profit for 1955 was £1,986,296 which included £232,372 surplus arising from a revision of the basis of valuation of work in progress. It is proposed to pay a final ordinary dividend of 11 per cent on £4,579,411 ordinary stock, which with the interim dividend of 6½ per cent on £3,052,941 before a one-for-two rights issue, makes 17½ per cent for the year. The total dividend for 1955 was 16¼ per cent.

The British Oxygen Co., Ltd.—In referring to the progress of the various divisions of the group in his speech at the annual meeting held on 27th March, Mr. J. S. Hutchison (chairman) said that Quasi-Arc, Ltd., fully held its position in the highly competitive fields of electrodes and electric welding equipment. Assiduous development work had yielded new processes and a number of patents of some importance. A good order book included complete automatic welding and positioning installations for nuclear energy plant construction and for special uses in shipbuilding. Progress in electric welding was encouraging.

Electric Construction Co., Ltd.—In our reference to the issue of £500,000 of convertible loan stock in our last issue we incorrectly stated that it was 5¼ per cent stock. This should have read 5¾ per cent. In the circular to ordinary and preference stockholders giving details of the issue, the directors state that in the five years to 31st March, 1956, the cost of additions to, and replacements of, buildings and plant, of investments in subsidiary companies and of providing additional working capital in respect of the increased volume and cost of stock and work-in-progress has amounted to approximately £990,000. Of this sum approximately £301,000 has been met out of the proceeds of issues of ordinary shares and the balance from retained profits (including depreciation) and bank advances. Since March, 1956, the figure of £990,000 has increased and bank advances have now reached approximately £300,000. The erection of a new factory, which is to be used for the production of automatic control gear, is now almost completed. The cost of the factory and the necessary equipment and plant will amount to approximately £140,000. Additions and improvements to buildings and plant generally are also in hand or contemplated in the near future. Additional working capital will be required in respect of the production of the new automatic control gear.

Efco, Ltd.—At an extraordinary general meeting held on 22nd March, the 313,000 issued ordinary shares and the 31,544 unclassified shares of £1 each were each sub-divided into ordinary shares of 10s each, and the capital of the company was increased from £500,000 to £600,000 by the creation of a further 200,000 ordinary shares of 10s each. The directors have decided to offer 208,668 ordinary shares of 10s each to existing shareholders by way of "rights" at a price of 10s per share, in the proportion of two new ordinary shares of 10s each for every three ordinary shares of £1 each held. Arrangements are being made for any of the new shares not accepted to be subscribed at the issue price by J. Henry Schroder & Co., and sold. The net proceeds, after deduction of the issue price, will be paid to ordinary shareholders not exercising their "rights."

Hilger & Watts, Ltd.—In the course of his speech at the annual meeting held on 27th March, Mr. G. A. Whipple (chairman and managing director) said that they were maintaining the policy of adding new types of instruments to their range. Their turnover continued to increase, but close watch was being kept on the level of stock. Development work throughout the year continued over a wide range. Recently a new department was created to design digitisers and associated data processing equipment. Many designs had been evolved from which a limited number would be selected for marketing; others would be incorporated into their own instruments. The United States was still their largest export market, and at home the foundations had been laid for an improvement in technical advice and for the servicing of their instruments.

Ericsson Telephones, Ltd.—The annual meeting was held on 29th March, Sir Harold A. Wernher (chairman) presiding. In the course of his speech, the chairman said that during the year under review they had worked to their maximum capacity and achieved the highest turnover in their history. Extensions of plant and buildings in hand would increase the floor space by well over 20 per cent. Nearly one half of the turnover last year was exported. Competition abroad tended to become keener, but they were holding their position. Home trade had been at a satisfactory level and the new lines introduced were contributing their quotas in increasing measure.

The advent of electronics had raised the possibility of applying these new techniques to telephone switching and their company was collaborating with the Post Office and other British manufacturers of telephone switching plant and they were hopeful that an experimental exchange would be completed within the next two or three years. Complementary to this, they themselves were working on a semi-electronic exchange, combining the advantages of both electro-mechanical and electronic principles.

The British Aluminium Co., Ltd., reports group manufacturing and trading profits for 1956 of £3,294,439, as compared with £3,248,463 for the previous year. Taxation requires £1,852,251, and after crediting unrequired tax provision of £253 280, the net balance is £1,493,959 (against £1,371,972). It is proposed to pay a final ordinary dividend of 8 per cent, making 12 per cent on capital increased to £7 million by a £2 million rights issue. For the previous year the total dividend was also 12 per cent on the smaller capital.

A. H. Hunt (Capacitors), Ltd.—After providing for a loss of the Canadian subsidiary, the group profit for 1956 is £112,969, as compared with £179,458 for the previous year, to which is added loss of Canadian subsidiary applicable to minority interests of £27,504. Taxation absorbs £98,433 and the net profit is £42,040 (against £96,129). It is proposed to pay a final dividend of 10 per cent, making 13¾ per cent for the year. For the previous year the total distribution was 17½ per cent, of which the interim dividend of 7½ per cent was paid on capital before a 100 per cent scrip issue. The balance carried forward is £47,549 (against £46,033 brought in).

Franco Signs, Ltd.—The main figures in the accounts for the year to 30th September last were given in our issue of 1st March. In his review of the year, Mr. J. F. Mallabar (chairman) says that all the operating subsidiaries have done well during the year. The new regulations relating to traffic signs should result in additional business to their subsidiary, Franco Traffic Signs, Ltd. With regard to advertising signs, the volume of business being obtained is satisfactory.

The Telephone & General Trust, Ltd.—The group profit, for 1956, after meeting all charges, including £205,722 for taxation, is £401,197, as compared with £320,808 for the preceding year. Of this £304,090 is attributable to the holding company. It is proposed to pay a final ordinary dividend of 10 per

cent on £1,355,000 capital, making with the interim dividend of 3 per cent on the £1,110,000 capital 13 per cent for the year. For the previous year the total payment on the smaller capital was 12 per cent. Holders of the "A" ordinary capital receive a single payment of 13 per cent (against 12 per cent). The balance carried forward is £185,630 (against £156,909 brought in).

Charles Clifford, Ltd.—The accounts for 1956 show a consolidated trading profit of £154,512, as compared with £297,940 for 1955. Taxation requires £92,826, and the net profit is £65,291 (against £146,522). General reserve receives £67,083 and stock reserve £45,000. It is proposed to pay a final ordinary dividend of 7 per cent, making 10 per cent for the year. The balance carried forward is £94,170 (against £82,427 brought in).

The Oriental Telephone & Electric Co., Ltd., proposes to pay a dividend of 1s 9d on the ordinary stock 1s units for 1956. It is also proposed to provide for additional profits tax which will be payable in the event of the distribution of retained profits to members in the course of liquidation amounting to £10,000 (against a net provision of £55,680 in 1955 for estimated taxation liability including additional profits tax). The balance of the profit and loss account for the year is £27,998 (against £22,707 for 1955). Owing to the liquidation, during the year 1956, of the subsidiary company there will be no consolidated accounts.

The Superheater Co., Ltd.—The net profit of the parent company, after providing £298,172 for taxation, is £322,050 for 1956, as compared with £327,824 for 1955. The dividend for the year is maintained at 40 per cent by a final dividend of 20 per cent and a bonus of 10 per cent. Reserves receive £195,000 and the balance carried forward is £101,386 (against £87,005 brought in).

Parkinson & Cowan, Ltd.—The group trading profit for 1956 is £597,497, as compared with £218,877 for 1955, and after deducting all charges, including £172,257 for taxation, the net profit is £171,536 (against a loss of £35,456). The proposed ordinary dividend for the year is 9 per cent (against 5 per cent), and after placing £76,000 to reserves, the balance carried forward is increased by £12,613.

The Perak River Hydro-Electric Power Co., Ltd., has declared an interim dividend of 4 per cent (unchanged).

Joseph Lucas (Industries), Ltd., has announced an interim dividend of 2½ per cent (unchanged).

Pena Copper Mines, Ltd.—In a circular to the shareholders the company gives details of three major acquisitions referred to recently by the chairman. As we reported in our issue of 15th February, one of these is a substantial minority interest in Peto Scott Electrical Instruments, Ltd. The circular states that Pena Copper Mines has issued 100,000 ordinary shares in exchange for 300,000 Peto Scott shares of 1s each.

New Companies

Pickerings Electrical Services, Ltd.—Registered 19th March. Capital £10,000. Manufacturers of artificial lighting apparatus, electrical plant, machinery, etc. Directors: D. Pickering, jnr. (managing director), D. Pickering, senr. and S. G. Hidderley. Regd. office: 30-32, Chapel Street, Kilburn, Derbys.

Semiconductors, Ltd.—Registered 13th March. Capital £100. Manufacturers, buyers, sellers, importers and exporters of and dealers in all kinds of semi-conductors, including transistors, photo-transistors, and diodes and electronic components and materials, etc. Solicitors: Slaughter & May, 18, Austin Friars, E.C.2.

Audio Radio, Ltd.—Registered 27th February. Capital £1,000. Manufacturers and distributors of, agents for and wholesale and retail dealers in electrical goods, radio and television receivers and apparatus, etc. Directors: G. B. Adler and H. A. Meyers. Regd. office: 32a, Coptic Street, W.C.1.

N. G. Bailey (Appliances), Ltd.—Registered 27th February. Capital £1,000. Electrical, mechanical, radio, television, telephone, lighting, heating, motor and general engineers, etc. Directors: N. G. Bailey, C. Banks, C. J. Pethed and J. Illingworth. Regd. office: Burley Vale Works, Weaver Street, Kirkstall Road, Leeds.

N. G. Bailey (N.W.), Ltd.—Registered 27th February. Capital £1,000. Electrical, mechanical, radio, telephone, lighting, heating, motor and general engineers, etc. Directors: N. H. Bailey, C. Banks, C. J. Pethed and K. Barker. Regd. office: Burley Vale Works, Weaver Street, Kirkstall Road, Leeds.

Anglian Development, Ltd.—Registered 11th February. Capital £100. Electricians, mechanical engineers, manufacturers of and dealers in electrical apparatus, etc. Regd. office: 1149, London Road, Leigh-on-Sea, Essex.

Farrells (Radio), Ltd.—Registered 15th February. Capital £5,000. To acquire the business of a retailer of radio and television and electrical appliances, carried on by T. J. Farrell, at Market Drayton, etc. Directors: T. J. Farrell, R. Farrell and K. Farrell. Regd. office: 11a, High Street, Market Drayton, Salop.

Period High Fidelity, Ltd.—Registered 1st February. Capital £100. Manufacturers of and dealers in high fidelity radio, gramophone, recording and television units, etc. Directors: D. G. Yeats-Brown, P. J. Tye and J. D. Shearmur. Regd. office: 28, South Street, W.1.

Arthur C. Symons, Ltd.—Registered 13th February. Capital £100. To acquire the business of an electrical engineer and contractor carried on by A. C. Symons, at 102, Bancroft, Hitchin, and 129, Sish Lane, Stevenage, Herts. etc. Permanent directors: A. C. Symons and Eva M. Symons. Secretary: A. C. Symons. Regd. office: 102c, Bancroft, Hitchin, Herts.

Felgate Electronics, Ltd.—Registered 25th March. Capital £100. Manufacture, distribution and sale of electrical and electronic instruments, etc. Directors: A. S. Williams and B. J. Benzimra. Regd. office: Felgate House, Studland Street, W.6.

Meadows Electrical (Installations), Ltd.—Registered 25th March. Capital £1,000. E. Meadows is the first director. Regd. office: 101-3, Baker Street, W.1.

Popular Electrical Products (Leeds), Ltd.—Registered 13th February. Capital £500. To acquire the business of retail sale, maintenance and repair of electrical equipment carried on at Leeds as "Premier Electrical Products." Directors: R. M. Roo, C. W. Bycroft and W. Le Petite. Secretary: C. W. Bycroft. Regd. office: 63, North Street, Leeds.

Electric Elements (Surrey), Ltd.—Registered 14th February. Capital £1,000. Manufacturers, distributors, wholesalers and retailers of electric heating elements, and dealers in electrical apparatus and supplies, etc. Directors: E. J. C. Algar, W. H. Green and J. E. Fitchett. Secretary: A. J. Greaney.

Controls and Electronics, Ltd.—Registered 14th February. Capital £100. Manufacturers of and dealers in electronic equipment for the automatic control, flame failure recognition and ignition systems of and in oil burners and combustion equipment of all kinds, etc. Solicitors: Wright & Bull, 25, Old Buildings, Lincoln's Inn, London, W.C.2.

Bankruptcies

F. Kent, 397, High Street, Lincoln, trading as Lincoln Factoring Co., electrical wholesaler.—First and final dividend of 1s 10¾d in the £, payable on and after 5th April at the Official Receiver's office, 27, Regent Street, Park Row, Nottingham.

R. J. Camden, 32, New Bridge Street, Exeter, electrical engineer.—Trustee, Mr. G. C. Ehlers, 28, Baldwin Street, Bristol, 1, released 8th March.

F. Smith, 6, Imperial Buildings, Dale End, Birmingham, wholesale electrical accessories factor.—Supplemental dividend of 1s 3¼d in the £, payable at the Official Receiver's office, Somerset House, 37, Temple Street, Birmingham, 2.

W. B. McKelvey, 2, High Road, Drayton, Norfolk, electrical contractor.—First and final dividend of 1s 4d in the £, payable at the Official Receiver's office, Castle Chambers, Opie Street, Norwich.

R. Powell, residing at 28, Sedbergh Crescent, Newbold, Chesterfield, and lately carrying on business as an electrical goods retailer under the style of Domestic Electrics, at 127, Newgate Lane, Mansfield, Notts.—First and final dividend at 3s 7d in the £, payable at the Official Receiver's office, 55, Queen Street, Sheffield.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 13th April:—

HOTPOINT MAJOR. No. 758,553. Class 7. Washing machines. — Hotpoint Electric Appliance Co., Ltd., Crown House, Aldwych, London, W.C.2.

SQUARE D. No. 738,074. Class 9. Electric switches.—Square D Co., Milwaukee, Wisconsin, U.S.A. Address for service, c/o W. E. P. Bayly, c/o The Plessey Co., Ltd., 56, Vicarage Lane, Ilford, Essex.

PROXICORD. No. 755,723. Class 9. Electrically operated level indicators.—J. Edward Hall (Elec. Engineers), Ltd., Clarence Road Works, Clarence Road, Leeds, 10.

JAGUAR. No. 758,889. Electric suction cleaners and electric floor polishing machines. VISCOUNT. No. 759,801. Class 9. Electric suction cleaners.—Vactric, Ltd., 35, Sunbeam Road, London, N.W.10.

AQUATROL. No. 759,574. Class 9. Apparatus for indicating or for automatically controlling by means of electric current the level of liquids.—Fielden Electronics, Ltd., Paston Road, Wythenshawe, Manchester.

UTILIVAC. No 761,144. Class 9. Electric vacuum cleaning apparatus and parts.—Bvlock Electric, Ltd., 109, South Street, Enfield, Middx.

BROWNSON. No. 753,706. Class 11. Electrically heated and gas heated apparatus for making coffee; trolleys incorporating electrically heated insulated food containers; trolleys incorporating water storage tanks, wash basins and waste water tanks; electrically heated airing and drying cabinets; and electrically heated urns.—A. Browne & Son (Sheet Metal Manufacturers), Ltd., 28-30, Hythe Road, Willesden, London, N.W.10.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 0d each including postage) will be obtainable after 10th April from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1951

12984. United Kingdom Atomic Energy Authority.—Steam boiler installations. 22nd August, 1952. (772353.)

1952

21427. British Thomson-Houston Co., Ltd.—Hermetically sealed electric circuit elements. 18th August, 1953. (772231.)

27005. Electric & Musical Industries, Ltd.—Sealing of glass end walls to metal envelopes. 22nd September, 1953. (772244.)

27347. General Electric Co., Ltd., and Jenkins, J.—Sintered metallic bodies and their manufacture. 21st October, 1953. (772435.)

1953

5752. Licentia Patent-Verwaltungs-Ges.—A.c. circuit arrangement comprising two ignitron discharge valves connected in parallel back-to-back relationship. 2nd March, 1953. (772045.)

24050. Siemens-Schuckertwerke Akt.-Ges.—Slot conductors for dynamo-electric machines. 31st August, 1953. (772439.)

32355. National Research Development Corporation.—Spectral analysis by electrical light-sensitive means. 15th November, 1954. (772250.)

32670/1. Plessey Co., Ltd.—A.c. generating and supply systems. 13th January, 1955. (771996/7.)

33881. Ericsson Telephones, Ltd., and Distin, L. S.—Contact assemblies for electromagnetic relays. 3rd December, 1954. (772008.)

33996. General Electric Co.—Apparatus for measuring electrical quantities which determine magnetic field intensities. 7th December, 1953. (771958.)

36158. Fielden Electronics, Ltd.—Apparatus for continuous testing of materials. 14th December, 1954. (772049.)

1954

1093. Newby, H. (Chemische Werke Hüls Akt.-Ges.).—Electrolytic apparatus. 6th January, 1955. (772359.)

1356. Wolseley Engineering, Ltd., and Drake, R. S.—Supply apparatus for electric fences. 29th November, 1954. (771920.)

2076. Automatic Telephone & Electric Co., Ltd.—Electromagnetic relays. 27th October, 1954. (771912.)

4336. Fielden Electronics, Ltd., and Fielden, J. E.—Electrical apparatus. 21st January, 1955. (772253.)

4993. Lilley, A.—Portable mercury electric switches, particularly for motor speed control. 18th May, 1955. (772444.)

5465. Solartron Electronic Group, Ltd.—Low frequency oscillators. 23rd February, 1955. (772235.)

6511. English Electric Co., Ltd.—Electric motor control systems. 4th March, 1955. (772293.)

8457/8. Western Electric Co., Inc.—Electron-discharge devices of the travelling wave type. 23rd March, 1954. (772000/1.)

9055. Communications Patents, Ltd.—Electrically operated integrating apparatus. 13th May, 1955. (772010.)

10613. Ferranti, Ltd.—Maximum demand electricity measuring instruments. 6th July, 1955. (772087.)

11506. Landis & Gyr Akt.-Ges.—Method of and apparatus for determining the cumulative maximum of the recordings of a number of maximum demand meters. 21st April, 1954. (771923.)

11898. Automatic Telephone & Electric Co., Ltd.—Automatic telephone systems. 5th April, 1955. (772013.)

13252. E.M.F. Electric Co. Pty., Ltd.—Apparatus for electric arc welding. 6th May, 1954. (772430.)

14199. Chemelex Corporation.—Heat-resistant electrically conducting coatings. 14th May, 1954. (772449.)

14688. Cinema-Television, Ltd.—Cathode mountings for electron guns. 19th May, 1955. (771962.)

14835. Philips Electrical Industries, Ltd.—Electric incandescent lamps. 26th April, 1955. (772450.)

17997. Cooke & Ferguson, Ltd.—Electrical insulators. 13th September, 1955. (772054.)

18794. Electric & Musical Industries, Ltd.—Commutator type electric switches. 24th June, 1955. (772260.)

20095. Lee, E.—Electrical counting apparatus. 7th July, 1955. (772055.)

20183. Bendix Aviation Corporation.—Apparatus for analogue computation. 9th July, 1954. (772089.)

20203. General Electric Co., Ltd.—Thermal electric switches. 11th July, 1955. (772056.)

21580. Collins Radio Co.—Method for maintaining a fixed phase relationship in r.f. amplifiers and oscillator circuits employing LCR resonant circuits. 23rd July, 1954. (771929.)

21744. Igranic Electric Co., Ltd.—Control systems for electric motors. 26th July, 1954. (772021.)

23649. Compagnie pour la Fabrication des Compteurs et Matériel d'Usines a Gaz.—Electric time signal apparatus. 13th August, 1954. (772023.)

24364. Hoover, Ltd.—Commutators. 5th August, 1955. (772460.)

26665. Siemens & Halske Akt.-Ges.—Electron tube arrangements consisting of a travelling-wave tube and a magnetic focusing system. 14th September, 1954. (772091.)

27148. Philips Electrical Industries, Ltd.—Production of modulated electromagnetic waves. 20th September, 1954. (771931.)

29528. British Thomson-Houston Co., Ltd.—Insulated electrical apparatus. 13th October, 1954. (771934.)

30242. Etablissements E. Jaeger.—Electric thermometers. 20th October, 1954. (Addition to 747828.) (772266.)

30929. Siemens & Halske Akt.-Ges.—Apparatus for exclusively connecting one of a plurality of circuits with common equipment intended to serve all of said circuits. 26th October, 1954. (772267.)

31898. Böhler & Co. Akt.-Ges., Geb.—Device for supplying current to welding electrodes, for heating and drying coating materials applied thereto. 4th November, 1954. (772064.)

33150. Western Electric Co., Inc.—Travelling-wave tubes. 16th November, 1954. (772002.)

33296. Sunbeam Corporation.—Electric frying pan. 17th November, 1954. (772268.)

36930. Egyesult Izzolampa es Villamos-Ssagi R. T.—Manufacture of tungsten powder and articles made therefrom. 21st December, 1954. (772067.)

1955

6330. Anthony, J.—Electromotors. 3rd March, 1955. (772036.)

6555. Eaton Manufacturing Co.—Speed-responsive electromagnetic switch control. 5th March, 1955. (772153.)

6761. Yao Musen Kabushikikaisha.—Method of compensating angular transmission characteristics electrically with particular functional ratio. 8th March, 1955. (771974.)

6930. Philips Electrical Industries, Ltd.—Circuits comprising gas and/or vapour filled electric-discharge tubes. 9th March, 1955. (771940.)

6971. Smit & Co.'s Transformatoren-Fabriek, N.V., W.—Electric transformers or choke coils with laminated magnetic cores. 9th March, 1955. (772037.)

7368. Forges et Ateliers de Constructions Electriques de Jeumont.—Electric cable joints. 14th March, 1955. (772154.)

8360. Rowenta, Metallwarenfabrik Ges.—Control mechanism for electric heating appliances. 22nd March, 1955. (771941.)

11136. Northern Electric Co., Ltd.—Fault locating apparatus. 18th April, 1955. (772205.)

11628. Union Carbide & Carbon Corporation.—Galvanic cells. 22nd April, 1955. (772038.)

13794. Hainault, M.—Variable speed electric driving devices for surgical tools. 12th May, 1955. (772210.)

13921. General Railway Signal Co.—Multiple position electric switches. 13th May, 1955. (772040.)

14614. General Motors Corporation.—Transistor amplifiers. 20th May, 1955. (771945.)

15144. Soc. Industrielle de Liaisons Electriques.—Junction devices for electrical conductors. 25th May, 1955. (772074.)

15220. Philips Electrical Industries, Ltd.—Receiving circuit arrangements for frequency modulated oscillations. 26th May, 1955. (771979.)

17793. Polytechnic Institute of Brooklyn.—Broadband microwave power meters. 20th June, 1955. (771947.)

19869. British Thomson-Houston Co., Ltd.—Electric-glow discharge cells. 8th July, 1955. (772333.)

21150. Philips Electrical Industries, Ltd.—Transistor amplifiers. 21st July, 1955. (772117.)

21476. Sulzer Freres Soc. Anon.—Machine assemblies comprising a turbine and a machine driven by the turbine. 25th July, 1955. (772121.)

21589. Laboratory for Electronics, Inc.—Apparatus for interpreting electrical data signals. 26th July, 1955. (772102.)

22635. Magnetic Heating Corporation.—Welding by high-frequency induction heating. 5th August, 1955. (772398.)

22897. Inventio Akt.-Ges.—Device on electrically driven elevators for stopping exactly at floor level. 9th August, 1955. (772326.)

24024. General Electric Co.—Electric transformers. 19th August, 1955. (772402.)

25333. Varian Associates. — Nuclear reactor. 2nd September, 1955. (772404.)

26272. Standard Telephones & Cables, Ltd.—Electric band-stop filters. 14th September, 1955. (772217.)

29593. Hazeltine Corporation.—Colour-image-reproducing apparatus. 17th October, 1955. (772222.)

30047. General Electric Co.—Air conditioning apparatus. 20th October, 1955. (772131.)

30970. Siemens-Schuckertwerke Akt.-Ges.—Electrical power converting and controlling installations in, or for use in, electric locomotives. 28th October, 1955. (772227.)

32767. Pirelli Soc. per Azioni.—Joints or terminals for high-tension electric cables. 16th November, 1955. (Addition to 752377.) (772229.)

36120. General Electric Co.—Slot liners for dynamo-electric machines. 16th December, 1955. (772418.)

36322. Skillman & Co. Pty., Ltd., T. S.—Electrical transformers and other cored coils. 19th December, 1955. (772137.)

1956

2224. Solartron Electronic Group, Ltd.—Measuring of the amplitude of low frequency oscillations. 23rd February, 1955. (Divided out of 772235.) (772236.)

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

Monday, 8th April

LONDON.—White Hall Hotel, Bloomsbury Square, 7.30 p.m. A.S.E.E. Central London Branch. "Rheostatic Controls of Oil Burners and other Apparatus," by S. O. Grant.

MALVERN.—Winter Gardens. I.E.E. South Midland Centre, district meeting. "Stereosonic Sound," by W. A. M. Clarke.

NEWCASTLE-UPON-TYNE. — Royal Station Hotel, 6.15 p.m. I.E.E. North-Eastern Centre. Annual general meeting and conversazione.

SHEFFIELD. — The University, Western Bank, 6.30 p.m. I.E.S. Sheffield Centre. Annual general meeting followed by lecture on "Lighting at London Airport," by J. G. Holmes.

WEMBLEY PARK.—Century Hotel, Forty Avenue, 8.15 p.m. A.S.E.E. North-West London Branch. "Electronics and Digital Computers," by Dr. L. E. C. Hughes.

YORK.—Royal Station Hotel, 7.30 p.m. A.S.E.E. York Branch. "Fire Alarm Systems," by R. L. Moulson.

Tuesday, 9th April

BELFAST.—Queen's University, 6.30 p.m. I.E.E. Northern Ireland Centre. "Age and the Incidence of Fires in Electrical Installations," by L. Gosland.

BOURNEMOUTH. — Grand Hotel, Firvale Road, 8 p.m. A.S.E.E. Bournemouth Branch. "Application of Electricity in Hospitals."

INVERNESS.—I.E.E. North Scotland Sub-Centre. "Nuclear Reactors and Power Supply," by G. W. K. Ford.

LEEDS.—1, Whitehall Road, 7 p.m. I.E.E. North Midland Graduate and Student Section. Students' Lecture, "Digital Computers and how they may help the Engineer," by Dr. M. V. Wilkes.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurement and Control Section. "A Deep Electrolytic Tank for the Solution of 2- and 3-dimensional Field Problems in Engineering," by E. R. Hartill, J. G. McQueen and P. N. Robson.

Lighting Service Bureau, 2, Savoy Hill, W.C.2, 6 p.m. Illuminating Engineering Society. "Aviation Ground Lighting," by E. S. Calvert.

MANCHESTER.—Free Trade Hall, 7.30 p.m. I.E.E. North-Western Centre. Faraday Lecture, "Nuclear Energy in the Service of Man," by Dr. T. E. Allibone.

Engineers' Club, Albert Square, 7.15 p.m. Incorporated Plant Engineers, Manchester Branch. "Practical Fundamentals of Electricity," by H. L. Buxton.

College of Technology, 7.30 p.m. Society of Instrument Technology, Manchester Section. "The Science and Art of Instrumentation," by J. K. Burkitt.

TAUNTON.—Electricity House. I.E.E. Bristol Graduate and Student Section. "The Design and Use of Battery Chargers," by B. Charles.

Tuesday, 9th April, to Thursday, 11th April

LONDON.—Grosvenor House, Park Lane, W. British Radio Component Show.

Tuesday, 9th April, to Friday, 12th April

LONDON.—Caxton Hall and Connaught Rooms. British Electrical Development Association. Annual Conference.

Tuesday, 9th April, to Saturday, 13th April

BRIGHTON.—Grand Hotel. Institute of Metal Finishing. Annual conference.

LONDON.—Earls Court. Electrical Engineers' Exhibition. Opening by Lord Hailsham, 12 noon, 9th April.

Wednesday, 10th April

ABERDEEN. — Robert Gordon's Technical College. I.E.E. North Scotland Sub-Centre. "Nuclear Reactors and Power Supply," by G. W. K. Ford.

BIRMINGHAM.—James Watt Institute, 6.30 p.m. I.E.E. South Midland Graduate and Student Section. "Irradiation of Materials," by Dr. A. Charlesby and W. H. T. Davison. Joint meeting with the Institutions of Civil and Mechanical Engineers.

Birmingham Exchange and Engineering Centre, Stephenson Place, 7.15 p.m. A.S.E.E. Birmingham Branch. "Power Transformers," by P. G. Sanderson.

BLACKBURN. — N.W.E.B. Demonstration Theatre, Jubilee Street, 7.15 p.m. I.E.E. North Lancashire Sub-Centre. "Electrical Energy from the Wind," by E. W. Golding.

BRADFORD.—Midland Hotel, 8 p.m. A.S.E.E. Bradford Branch. "Wanderings with a Colour Film Camera," by A. Spencer.

BRISTOL.—Grand Hotel, 7.15 p.m. Incorporated Plant Engineers, Western Branch. "Problems" evening.

GLASGOW.—39, Elmbank Crescent, 7 p.m. I.E.E. South-West Scotland Sub-Centre. "Temperature Rises in Electrical Machines on Variable Load and with Variable Speed," by Prof. A. Tustin and Dr. J. J. Bates.

HALIFAX.—Crown Hotel, Horton Street, 7.30 p.m. A.S.E.E. Halifax Branch. Lecture by C. H. Vaughan.

LEICESTER.—College of Art and Technology, 7 p.m. Incorporated Plant Engineers, Leicester Branch. "Factory Lighting," by A. Holden.

LIVERPOOL.—Philharmonic Hall, 6.30 p.m. I.E.E. Mersey and North Wales Centre. Faraday Lecture, "Nuclear Energy in the Service of Man," by Dr. T. E. Allibone.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio and Telecommunication Section. "The Remote and Automatic Control of Semi-Attended Broadcasting Transmitters," by R. T. B. Wynn and F. A. Peachey.

University College, Gower Street, 7.30 p.m. Radar Association. "Radar Technique and Research of Wave Propagation," by Dr. R. L. Smith-Rose.

London School of Hygiene and Tropical Medicine, Keppel Street, 6.30 p.m. British Institution of Radio Engineers. "The Uses of Electroplated Coatings in the Electronics Industry," by R. W. Stobbs.

MANCHESTER. — Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Supply Group. "Mechanical Strength of Power Transformers in Service," by E. T. Norris.

NEWCASTLE-UPON-TYNE. — Neville Hall, Westgate Road, 6 p.m. British Institution of Radio Engineers, North-Eastern Section. Annual general meeting.

NORTHAMPTON.—College of Technology, 7.15 p.m. Northampton and District Electrical Association. "Automation."

STAFFORD.—Technical College, 7.15 p.m. I.E.E. North Staffs. Graduate and Student Section. "Modern Techniques in the Protection of Large Turbo-Alternators," by C. F. Ferguson.

Thursday, 11th April

DUNDEE.—Queen's College, 7 p.m. I.E.E. North Scotland Sub-Centre. "Nuclear Reactors and Power Supply," by G. W. K. Ford.

HULL. — Y.E.B., Ferensway, 7.15 p.m. I.E.E. North Midland Centre. "Highland Water Power—The Developments of the North of Scotland Hydro-Electric Board," by the late T. Laurie. (To be read by a member of the Board.)

LIVERPOOL. — Chamber of Commerce, 1, Old Hall Street, 6.45 p.m. British Institution of Radio Engineers, Merseyside Section. Annual general meeting.

Exchange Hotel, 7.15 p.m. Incorporated Plant Engineers, Merseyside and N. Wales Branch. "Engineering in the Making of Refractories," by E. Snodgrass.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Utilisation Section. "Development of Transportable Thermal - Storage Space Heaters," by E. Bates, and "Electrical Floor Warming," by J. W. Moule and W. M. Stevenson.

MANCHESTER. — N.W.E.B., Town Hall, 5 p.m. I.E.S. Manchester Centre. Annual general meeting.

MIDDLESBROUGH.—Cleveland Scientific and Technical Institution, Corporation Road, 7.30 p.m. Society of Instrument Technology, Tees-Side Section. "Some Aspects of Quality Control Instrumentation," by G. C. Etenton and F. Sumner.

PETERBOROUGH.—White Lion Hotel, Church Street, 7.30 p.m. Incorporated Plant Engineers, Peterborough Branch. "Workshop Maintenance at a U.S.A.F. Base in England."

SOUTHAMPTON.—Polygon Hotel, 8 p.m. A.S.E.E. Southampton Branch. "Radio Frequency Heating," by P. B. Curtis.

WIMBLEDON.—Prince of Wales Hotel, 2, Hartfield Road, 7.30 p.m. A.S.E.E. South-West London Branch. "In Search of Coal," by W. H. Brooks.

Friday, 12th April

BATH.—Royal York House Hotel, 8 p.m. A.S.E.E. Bristol and West of England Branch. Calder Hall Film.

BIRMINGHAM.—Regent House, St. Philip's Place, Colmore Row, 7 p.m. Society of Instrument Technology, Midland Section. Annual general meeting, followed by exhibition of modern instruments and associated components.

Queen's Hotel, 7 for 7.30 p.m. Institution of Production Engineers, Midlands Region. Annual dinner.

CREWE.—Royal Hotel, 7.30 p.m. A.S.E.E. Stoke and Crewe Branch. "Electrical Fire Alarms," by R. B. Whitehouse.

LONDON.—Pepys House, 14, Rochester Row, Westminster, 7 p.m. Junior Institution of Engineers. "Electric Locomotive Design," by F. J. G. Haut.

1, Birdcage Walk, Westminster, 6 p.m. Institution of Mechanical Engineers, Applied Mechanics Group. "The Influence of Dynamical Imperfection on the Vibration of Rotating Discs," by Dr. S. A. Tobias and Dr. R. N. Arnold.

Palmerston Restaurant, 6 for 6.45 p.m. E.P.E.A. Southern Meter Engineers' Technical Group. Annual dinner.

Café Monico, Piccadilly Circus, W., 6 for 7 p.m. Annual reunion of the staff of the former Edmundsons Electricity Corporation.

Friday, 12th April, to Monday, 15th April

LONDON.—Waldorf Hotel, W.C.2. London Audio Fair.

Saturday, 13th April

LEEDS.—Hotel Metropole, 6 for 6.30 p.m. Institution of Production Engineers, Leeds Section. Annual dinner.

Management Conference

The 1957 Scottish Management Conference, organised by the British Institute of Management, will be held at Gleneagles from 3rd to 5th May. The theme will be "Top Management Planning and Control." Particulars can be obtained from the Institute, Management House, 8, Hill Street, London, W.1.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—Electricity Commission of New South Wales, Sydney. Remote supervisory apparatus. (E.S.B. 7710/57. Ten/25016.)*

Burma.—Burma Purchase Board, Rangoon. 8th April. Street lighting fittings. (E.S.B. 7806/57. Ten/24964).*

Dromore (Co. Down).—The Down County Education Committee. 18th April. Electrical installation in new intermediate school. J. McCandless, consulting engineer, 6, Murray Street, Belfast.

Edinburgh.—North of Scotland Hydro-Electric Board. Electrical services at St. Fillans and Dalchonzie power stations. (See this issue.)

Formosa.—Central Trust of China, Taipei. 29th April. Stationary battery measuring equipment, etc. (E.S.B. 8261/57. Ten/25040.)*

Hereford.—City Council. 15th April. Electrical installations in 114 houses, Green Lanes estate. Building officer, Town Hall.

India.—Director General of Supplies and Disposals. 23rd April. Aluminium stranded conductors. (E.S.B. 7655/57. Ten/24927.)*

Madhya Pradesh Electricity Board, Nagpur. 23rd April. Transformers. (E.S.B. 8213/57. Ten/25046.)*

Iraq.—Directorate General of Municipalities, Baghdad. 18th May. Fifteen 200 kVA transformers. (E.S.B. 7847/57. Ten/25008.)*

New Zealand.—Director-General (Stores Division), G.P.O. 24th April. Coaxial resonator-type filters. (E.S.B. 7796/57. Ten/24982.)*

Ramsbottom.—U.D.C. 1st May. Street lighting equipment. (See this issue.)

Rhodesia and Nyasaland.—Tender Board, Causeway. 12th April. Generating set for Sebakwe. (E.S.B. 7499/57. Ten/24910.)*

South Africa.—Stores Department, South African Railways, Johannesburg. 17th April. Electric furnace. (E.S.B. 7849/57. Ten/24974.)* 18th April. Electric cable. (E.S.B. 7556/57. Ten/24926.)* 26th April. Stay rods. (E.S.B. 7789/57. Ten/25011.)*

Union Tender and Supplies Board. 18th April. Terminal blocks and box connections. (E.S.B. 7631/57. Ten/24925.)*

Southend-on-Sea. — Corporation. 26th April. Electrical work at Central Library. (See this issue.)

United States.—Bureau of Reclamation, Denver. 11th April. Three 5,000 kVA outdoor shunt reactors. (E.S.B. 7433/57. Ten/24953.)* Switchboard section control equipment. (E.S.B. 7432/57. Ten/24958.)*

ORDERS PLACED

Biddulph.—U.D.C. Main road lighting (£11,695).—British Thomson-Houston Co.

Ealing.—Works and Highways Committee. Recommended. Street lighting in North Circular Road, W.5 (£2,392).—G.E.C.

Glasgow.—Corporation. Electrical installation in home for aged persons, Windlaw, Castlemilk (£1,790) and electrical work at lighting depot, Helen Street (£2,269).—J. B. Meiklejohn.

Corporation Highways Committee. Electrically driven centrifugal pump at Shieldhall sewage works (£3,528).—Drysdale & Co.

London.—Poplar Borough Council Contracts and Purchasing Committee. Electrical installation work, Abbott Road area (£1,783).—Iverson Electrical.

Newcastle-on-Tyne. — Regional Hospital Board. Electrical installation at maternity department, Workington Infirmary (£6,133).—D. Thomson & Son. Electrical work at Dovenby Hall Hospital (£2,036).—Dixon Barker & Co. Electrical work at Winterton Hospital (£6,647).—North of England Engineering & Electrical Co.

Woodford.—Metropolitan Water Board Works and Stores Committee. Installation of electric cables, switchgear, lighting fittings, etc., at Woodford pumping station (£2,812).—W. J. Furse & Co. (London), Ltd.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ascot.—Extensions to X-ray and out-patients' departments at Heatherwood Hospital (£103,000); Regional architect, North Western Metropolitan Regional Hospital Board, Sheffield House, Sheffield Street, London, W.C.2.

Bedford.—Bus station in town centre (work to commence early in 1958); borough architect.

Billericay.—Extensions to St. Andrew's Hospital; North East Metropolitan Regional Hospital Board, 3, Queen Anne Street, London, W.1.

Billingham-on-Tees.—Primary school, Low Granges area; county architect, South Street, Durham.

Bournemouth.—Works extensions; Moores (Bournemouth), Ltd., Wallisdown Road, Winton.

Bradford.—Rhodesway Secondary Modern School; Scherrer & Hicks, architects, 19, Cavendish Square, London, W.1.

Brighton.—Rebuilding premises in North Street to form banking hall and offices; R. H. Coleman-Cohen, secretary, Alliance Building Society, Princes House, Brighton, 1.

Bristol.—Shops and offices, Wine Street and Union Street; Court Farm Estates, Ltd., 2, Thames House, Queen Street Place, London, E.C.4.

Works extensions, Broad Road; John Knox, Ltd., Winterstoke Road.

Carlisle.—Shops, Morton estate; city engineer, 18, Fisher Street.

Coventry.—Three-storey office block, Harnall Lane; city architect.

Shops, offices and flats, Sewell Highway; E. K. Youell & Sons, Ltd., 503, Walsgrave Road.

Dartford.—Factory, Burnham Road; Amalgamated Oxides (1939), Ltd., Victoria Works, Victoria Road.

Durham.—Chemistry and geology building at Durham University; C. Elgey, architect, 7a, North Bailey, Durham.

Eastbourne.—Flats (55), Mostyn Terrace, King Edward's Parade; H. Hubbard Ford, architect, 24a, Cornfield Road.

Edinburgh.—Primary schools at Silverknowes Eastway and Wester Drylaw Avenue; city engineer, 329, High Street.

Felling (Co. Durham).—Factory for Drums, Ltd.; Young & Purvis, architects, 12, St. Anne's Square, Manchester, 2.

Glasgow.—Houses (978), Easterhouse; director of housing, 20, Trongate.

Hatfield.—Erection of central works depot, Wellfield Road, and dwellings (27), Birchwood estate; J. H. Parker, architect to R.D.C., 82, Great North Road, Hatfield.

Haverfordwest.—Omnibus depot, Lower Marsh; Western Welsh Omnibus Co., Ltd., College Street, Ammanford.

Homewood (Cumberland). — Proposed general hospital for Newcastle Hospital Board (£543,000); John Laing & Sons, builders, Dalston Road, Carlisle.

Hull.—Factory, Goulton Street; Sproston & Crowther, Ltd., Wyre Dock, Fleetwood.

Office block, Stoneferry Road; Spooners, Ltd., Glebe Road, Stoneferry.

Leicester. — Extensions to Stoneleigh Special School (£10,530); city architect.

Letchworth.—Extensions to Norton S.M. School (£108,900); C. H. Aslin, Herts. county architect, County Hall, Hertford.

London.—Seven-storey offices, 183-85, Tottenham Court Road; Robert Sharp & Son, architects, 13, Lower Belgrave Street, S.W.1.

Rebuilding All Hallows Church, Copperfield Street, Southwark; Thomas F. Ford & Partners, architects, 189, Victoria Street, S.W.1.

Flats (30) in three-storey blocks, and houses (16), Old Dover Road, Sunfields, Greenwich; H. Whetstone, town clerk, Town Hall, Greenwich High Road, S.E.10.

Nelson.—Factory, White Walls area; Southport & District Factory Estates, Ltd., 30, Stanley Street, Southport.

Perth.—Casualty and out-patients' department at the Royal Infirmary (£100,000); MacKillop & McIntosh, architects, Hospital Street, Perth.

Plymouth.—Bottling works, stores and offices; Ash & Sons (Devon), Ltd., 55, James Street.

Portsmouth.—Dwellings (84), Parkhouse Farm estate; Howe & Bishop, Ltd., builders, Crown Buildings, Clarendon Street.

St. Neots.—Private housing estate, Cambridge Street area; Lindum, Ltd., St. Neots, Hunts.

Scarborough.—High school; North Riding county architect, County Hall, Northallerton.

Slough.—Houses (108), Everitts estate, Bath Road; borough engineer, Town Hall.

Southampton.—Hall of Residence for University; A. F. Myers & Partners, consulting engineers, 147, Victoria Street, London, S.W.1.

Stevenage. — Schools, Camps Hill (£119,334); county architect, County Hall, Hertford.

Sunderland.—Proposed Farringdon Secondary Modern School (£160,000); John Laing & Sons, builders, Dalston Road, Carlisle.

Swansea.—Modernisation of electrical engineering laboratory at the Technical College; R. Moody, borough surveyor, Guildhall.

Uxbridge.—New maternity department (100 beds) at Hillingdon Hospital; regional architect, North West Metropolitan Regional Hospital Board, Sheffield Street, London, W.C.2.

Wakefield.—Science block for Queen Elizabeth Grammar School, Northgate; Farquharson & McMorran, architects, 14, North Audley Street, London, W.1.

Wembley. — Synagogue, Shaftesbury Avenue; The United Synagogue, Woburn House, Upper Woburn Place, London, W.C.1.

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* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

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